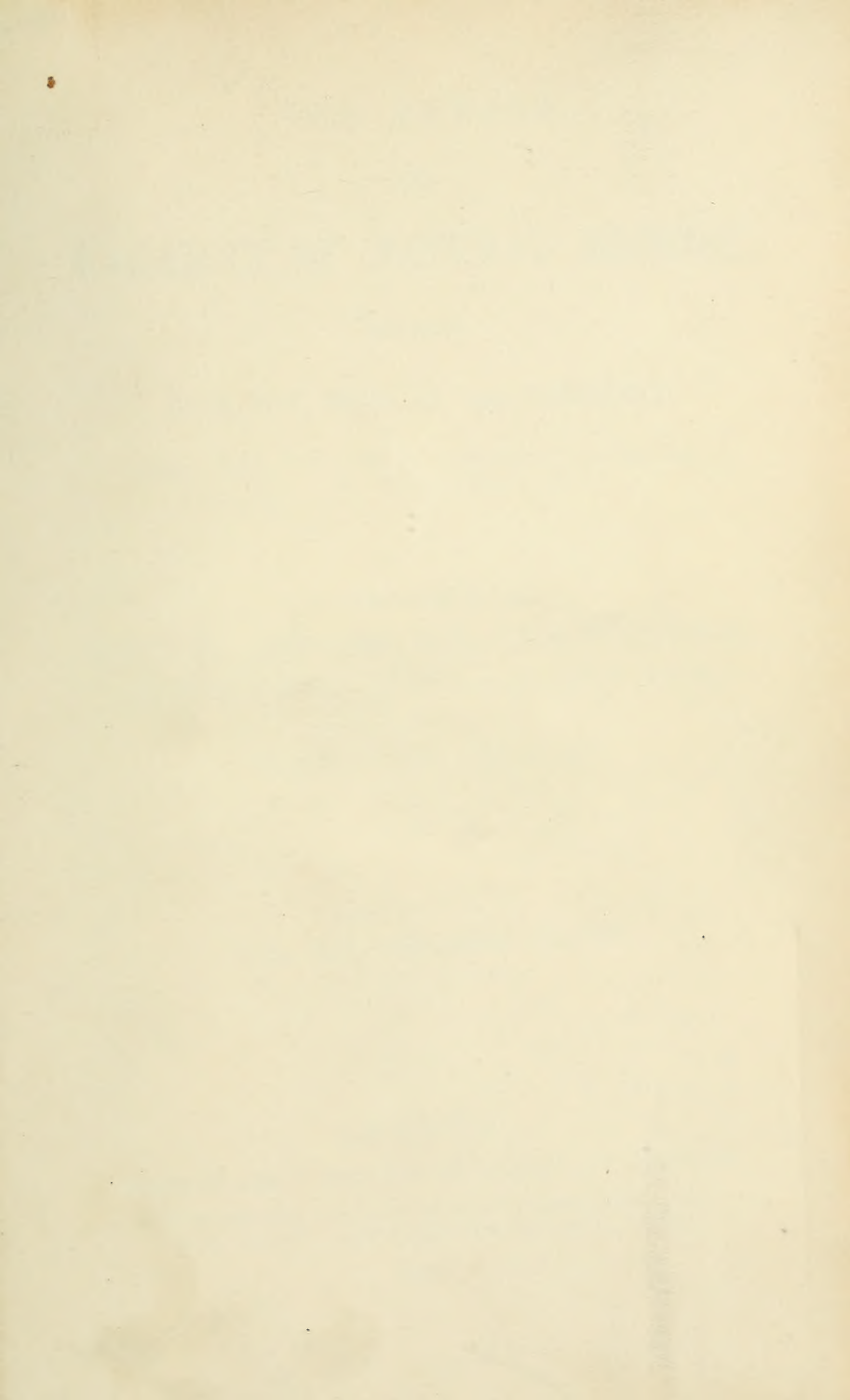


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THE ANNALS
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MAGAZINE OF NATURAL HISTORY,
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(BEING A CONTINUATION OF THE 'ANNALS' COMBINED WITH LOUDON AND
CHARLESWORTH'S 'MAGAZINE OF NATURAL HISTORY.')

CONDUCTED BY
WILLIAM CARRUTHERS, Ph.D., F.R.S., F.L.S., F.G.S.,
ARTHUR E. SHIPLEY, M.A., Sc.D., F.R.S., F.Z.S.,
AND
WILLIAM FRANCIS, F.L.S.

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VOL. XX.—EIGHTH SERIES.  
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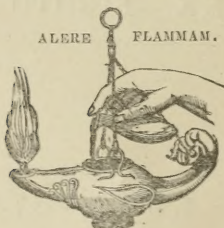
"Omnes res creatæ sunt divinæ sapientiæ et potentiæ testes, divitiæ felicitatis humanæ:—ex harum usu *bonitas* Creatoris; ex pulchritudine *sapientia* Domini; ex œconomiâ in conservatione, proportione, renovatione, *potentia* majestatis elucet. Earum itaque indagatio ab hominibus sibi relictis semper æstimata; à verè eruditis et sapientibus semper exulta; malè doctis et barbaris semper inimicæ fuit."—LINNÆUS.

"Quel que soit le principe de la vie animale, il ne faut qu'ouvrir les yeux pour voir qu'elle est le chef-d'œuvre de la Toute-puissance, et le but auquel se rapportent toutes ses opérations."—BRUCKNER, *Théorie du Système Animal*, Leyden, 1767.

. The sylvan powers
Obey our summons; from their deepest dells
The Dryads come, and throw their garlands wild
And odorous branches at our feet; the Nymphs
That press with nimble step the mountain-thyme
And purple heath-flower come not empty-handed,
But scatter round ten thousand forms minute
Of velvet moss or lichen, torn from rock
Or rifted oak or cavern deep: the Naiads too
Quit their loved native stream, from whose smooth face
They crop the lily, and each sedge and rush
That drinks the rippling tide: the frozen poles,
Where peril waits the bold adventurer's tread,
The burning sands of Borneo and Cayenne,
All, all to us unlock their secret stores
And pay their cheerful tribute.

J. TAYLOR, *Norwich*, 1818.

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7

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

“..... per litora spargite muscum,
Naiades, et circum vitreos considite fontes:
Pollice virgineo teneros hic carpite flores:
Floribus et pictum, divæ, replete canistrum.
At vos, o Nymphæ Craterides, ite sub undas;
Ite, recurvato variata corallia trunco
Vellite muscosis e rupibus, et mihi conchas
Ferte, Deæ pelagi, et pingui conchyliis succo.”
N. Parthenii Giannettasi, Eol. 1.

No. 115. JULY 1917.

I.—*A Revision of the Wasps of the Genus Tachytes inhabiting the Ethiopian Region.* By ROWLAND E. TURNER, F.Z.S., F.E.S.

THE following notes on the Ethiopian species of *Tachytes* are based on the collection in the British Museum, which is rich in species from Nyasaland and Uganda, but poor in species from West Africa and the dry regions of South Africa. The species run very close, and are most easily distinguished by the distance between the eyes on the vertex, the sculpture of the vertex, the shape of the pygidial area in the female, and of the seventh tergite and eighth sternite in the male, by the colour and distribution of the pubescence, the colour of the legs, and by the number of spines on the basal joint of the fore tarsus. In some of the larger females the sculpture of the second and third sternites is also important. The mouth-parts might also be of considerable use, but I have not had sufficient material available to use them as extensively as I could wish; there is, however, considerable variation in the palpi, in the length of the galea, and in the form of the ligula. The details of neuration,

though they have been much used in description, must be used with extreme caution in the distinction of species, being far from constant, variations being very common in the comparative length of the second and third abscissa of the radius. Comparatively few Ethiopian species of the genus have been described, and in most of the descriptions important characters—such as the apical segments of the male, the sculpture of the second and third sternites of the female, and the structure of the palpi and galea—have not been noticed. I have not included species from Madagascar in this paper, the collection being very poor in species from that island. The occurrence of a species of the subgenus *Calotachytes* in Madagascar is, however, interesting.

The species I have not seen are marked *.

Key to the Ethiopian Species of *Tachytes*.

♂♂.

1. Mandibles not excised on the outer margin; median segment striated on the dorsal surface, subrectangular, the apical angles not rounded; abdomen wholly light ferruginous red. Subgenus *Holotachytes*.
 Mandibles deeply excised on the outer margin; median segment not striated on the dorsal surface, the apical angles rounded; abdomen otherwise coloured [*T. dichroa*, Sm.
2. Maxillary palpi five-jointed; labial palpi three-jointed, very long and slender. Subgenus *Calotachytes*. 3.
 Maxillary palpi six-jointed; labial palpi four-jointed Subgenus *Tachytes*. 5.
3. Four basal tergites densely covered with brilliant silver pubescence; eighth sternite subtruncate, the angles not produced *T. marshalli*, Turn.
 Dorsal surface of abdomen covered with brilliant golden pubescence; eighth sternite emarginate, the angles produced 4.
4. Seventh tergite broadly rounded; wings subhyaline, with a pale fuscous apical band *T. mira*, Kohl.
 Seventh tergite truncate at the apex; wings strongly infuscate *T. admirabilis*, Turn.
5. Dorsal surface of abdomen densely clothed with bright golden pubescence; head and thorax entirely without golden pubescence 6.
 Abdomen not clothed with golden pubescence, or if so clothed then with some golden pubescence on the thorax also. 11.

6. Clypeus with three well-defined teeth on each side of the apical margin; galea shorter than scape *T. rhodesiana*, Bisch.
- Clypeus without clearly defined teeth; galea much longer than scape 7.
7. Eyes separated on the vertex by a distance not exceeding half the length of the second joint of the flagellum..... 8.
- Eyes separated on the vertex by a distance slightly exceeding three-quarters of the length of the second joint of the flagellum 10.
8. Joints 3-7 of the flagellum distinctly arcuate beneath; eighth sternite shallowly emarginate, the apical angles distinctly produced..... *T. neavei*, Turn.
- Joints of the flagellum not arcuate beneath; eighth sternite truncate, the angles not produced 9.
9. Abdomen and the greater part of the antennæ and legs ferruginous brown.. *T. basilica*, Guér.
- Black, the apical margins of the abdominal segments brown *T. observabilis*, Kohl.
10. Eighth sternite truncate, the angles not produced *T. velox*, Sm.
- Eighth sternite deeply emarginate, the angles strongly produced *T. perornata*, Turn.
11. Wings black, flushed with blue or violet; abdomen black, without pubescent fasciæ 12.
- Wings hyaline, subhyaline or flavo-hyaline, abdomen usually with pubescent fasciæ 13.
12. Front and clypeus clothed with long black hairs *T. nigropilosella*, Cam.
- Front and clypeus with short, sericeous, silver pubescence..... *T. natalensis*, Sauss.
13. Abdomen black, without pubescent fasciæ *T. nudiventris*, Turn.
- Abdomen with pubescent fasciæ, sometimes interrupted 14.
14. Two basal abdominal segments red *T. ambidens*, Kohl.
- Basal abdominal segments black 15.
15. Second to seventh joints of the flagellum strongly arcuate - dilatate beneath; wings flavo-hyaline, pale fusco-hyaline apically from the second cubital cell; pubescence of abdomen dense and golden, sparse golden pubescence on the sides of the mesonotum *T. dilaticornis*, Turn.
- Flagellar joints at most feebly arcuate beneath; wings, if flavo-hyaline, without a fusco-hyaline broad margin 16.
16. Galea very long, considerably more than twice as long as the scape..... 17.

- Galea less than twice as long as the scape,
often shorter than the scape 19.
17. All the tibiae and tarsi fulvo-ferru-
ginous *T. hamiltoni*, Turn.
At least the intermediate and hind tibiae
and tarsi black 18.
18. Fore tibiae and tarsi ferruginous *T. praestabilis*, Turn.
Fore tibiae and tarsi black *T. labilis*, Turn.
19. Tibiae and tarsi wholly bright fulvo-
ferruginous 20.
Tibiae and at least a portion of the tarsi
black; the tibiae rarely fusco-ferru-
ginous at the base 27.
20. Galea about half as long again as the
scape 21.
Galea no longer than the scape 22.
21. Seventh tergite truncate at the apex;
basal joint of the fore tarsus with six
spines *T. separabilis*, Turn.
Seventh tergite rounded at the apex;
basal joint of the fore tarsus with four
or five spines *T. irritabilis*, Turn.
22. Eighth sternite truncate, the apical
angles not produced; eyes very close
together on the vertex, separated
by a distance about equal to the
length of the first joint of the fla-
gellum 23.
Eighth sternite more or less emarginate
or bisinuate at the apex; eyes sepa-
rated on the vertex by a distance
equal to at least twice the length of
the first joint of the flagellum 24.
23. Second sternite with the apical half
shining, with coarse scattered punc-
tures; pubescence of mesonotum ful-
vous and dense, without underlying
golden pubescence; abdominal fasciae
silver-grey *T. testaceinerva*, Cam.
Second sternite closely and minutely
punctured; pubescence of mesonotum
golden-grey, with underlying golden
pubescence; abdominal fasciae golden-
grey *T. tomentosa*, Kohl.
24. Eighth sternite bisinuate at the apex,
the apical angles not produced *T. associata*, Turn.
Eighth sternite emarginate, the angles
produced 25.
25. Eyes separated on the vertex by a distance
equal to the combined length of the
second and third joints of the flagel-
lum *T. ugandensis*, Turn.
Eyes separated on the vertex by a dis-
tance less than or only slightly greater
than the length of the second joint of
the flagellum 26.

26. Eyes separated on the vertex by a distance scarcely exceeding half the length of the second joint of the flagellum *T. opposita*, Turn.
Eyes separated on the vertex by a distance fully equal to the length of the second joint of the flagellum..... *T. neglecta*, Turn.
27. Middle joints of the flagellum marked at least beneath with dull ochreous *T. pulchricornis*, Turn.
Middle joints of the flagellum entirely black..... 28.
28. Abdomen more or less densely covered with golden pubescence, much more densely on the apical fasciæ than elsewhere 29.
Pubescence of abdomen silver or grey, almost entirely confined to the apical fasciæ 30.
29. Eyes separated on the vertex by a distance less than the length of the second joint of the flagellum; basal joint of fore tarsus with six spines; eighth sternite shallowly emarginate *T. aurichalcea*, Kohl.
Eyes separated on the vertex by a distance greater than the length of the second joint of the flagellum; basal joint of fore tarsus with five spines; eighth sternite rounded *T. volubilis*, Turn.
30. Basal joint of fore tarsus with six or more spines 31.
Basal joint of fore tarsus with not more than five spines 33.
31. Basal joint of fore tarsus with eight spines; eighth sternite broadly rounded or subtruncate *T. habilis*, Turn.
Basal joint of fore tarsus with six spines; eighth sternite emarginate 32.
32. Eyes separated on the vertex by a distance exceeding the length of the second joint of the flagellum..... *T. inexorabilis*, Turn.
Eyes separated on the vertex by a distance scarcely exceeding half the length of the second joint of the flagellum *T. erynnis*, Turn.
33. Thorax punctured rugulose; median segment rugulose *T. notabilis*, Turn.
Sculpture of thorax and median segment microscopic 34.
34. Second and third sternites minutely and very closely punctured, subopaque 35.
Second and third sternites coarsely and not very closely punctured, shining.. *T. versatilis*, Turn.
35. Basal joint of fore tarsus with five spines; length 14 mm. *T. hirsuta*, Sm.

- Basal joint of fore tarsus with four spines;
length 11 mm..... 36.
36. Vertex with distinct and rather sparse
punctures; eighth sternite broad....
Vertex almost smooth, the punctures
microscopic; eighth sternite very
narrow *T. instabilis*, Turn.
- *T. disputabilis*, Turn.

♀ ♀.

1. Mandibles not excised on the outer
margin; median segment striated on
the dorsal surface, subrectangular, the
apical angles not rounded; abdomen
wholly light ferruginous red Subgenus *Holotachytes*.
Mandibles deeply excised on the outer
margin; median segment never
striated on the dorsal surface, rounded
at the apical angles; abdomen other-
wise coloured [*T. dichroa*, Sm.]
2. Maxillary palpi five-jointed; labial
palpi three-jointed, very long and
slender 2.
Maxillary palpi six-jointed; labial palpi
four-jointed Subgenus *Calotachytes*. 3.
3. The four basal dorsal segments densely
clothed with brilliant silver pubes-
cence Subgenus *Tachytes*. 5.
Dorsal surface of abdomen densely
clothed with brilliant golden pubes-
cence *T. marshalli*, Turn.
4. Wings dark fusco-hyaline 4.
Wings subhyaline, with a pale fuscous
apical margin *T. admirabilis*, Turn.
5. Dorsal surface of abdomen densely
clothed with bright golden pubes-
cence, head and thorax entirely with-
out golden pubescence; with six
spines on basal joint of fore tarsi 6.
Abdomen not clothed with golden pubes-
cence, or if so clothed then with some
golden pubescence on the thorax
also, or with only five spines on basal
joint of fore tarsi 9.
6. Clypeus with three distinct teeth on each
side on the apical margin; galea
shorter than scape *T. rhodesiana*, Bisch.
- *T. rhodesiana*, Bisch.
- 7.
7. Second sternite shining, with large
scattered punctures *T. velox*, Sm.
- 8.
- *T. basilica*, Guér.
8. Abdomen and the greater part of the
antennæ and legs dull ferruginous
brown *T. basilica*, Guér.

- Black; the apical margins of the abdominal segments brown *T. observabilis*, Kohl.
9. Wings black, flushed with blue; or dark fusco-hyaline 10.
Wings hyaline, subhyaline, or flavo-hyaline, sometimes pale fusco-hyaline at the apex 13.
10. Wings dark fusco-hyaline, abdomen with interrupted fasciæ of silver pubescence *T. mærens*, Turn.
Wings black, flushed with blue or purple 11.
11. Front and clypeus clothed with long black hairs *T. nigropilosella*, Cam.
Front and clypeus with short sericeous pubescence 12.
12. Pubescence of front and clypeus silver; anterior tibiæ black *T. natalensis*, Sauss.
Pubescence of front and clypeus golden; anterior tibiæ ferruginous *T. memnon*, Turn.
13. Abdomen black, without pubescent fasciæ *T. nudiventris*, Turn.
Abdomen with pubescent fasciæ 14.
14. Abdomen densely covered with silver pubescence 15.
The pubescence, if silver, restricted to the apical fasciæ on the dorsal segments 17.
15. Basal joint of fore tarsus with five spines *T. distantis*, Turn.
Basal joint of fore tarsus with six spines. 16.
16. Clypeus subtruncate at the apex; pygidial area clothed with golden pubescence *T. argenteovestita*, Cam.
Clypeus rounded at the apex; pygidial area clothed with reddish brown setæ *T. bulucayoensis*, Bisch.
17. Two basal abdominal segments at least red 18.
Basal abdominal segments black 19.
18. Three basal abdominal segments red; clypeus without prominent teeth; apical slope of median segment closely transversely striated *T. sjöstedti*, Cam.
Two basal abdominal segments red; clypeus with two prominent teeth; apical slope of the median segment closely and minutely punctured *T. ambidens*, Kohl.
19. Wings flavo-hyaline, fusco-hyaline apically from the second cubital cell; pubescence of abdomen dense and golden; sparse golden pubescence on the sides of the mesonotum *T. dilaticornis*, Turn.
Wings, if flavo-hyaline, without a broad fusco-hyaline margin 20.
20. Galea very long, more than twice as long as the scape 21.

- Galea less than twice as long as the scape, often shorter than the scape .. 23.
21. All the tibiae and tarsi fulvo-ferruginous *T. simulatrix*, Turn.
At least the intermediate and hind tibiae and tarsi black. 22.
22. Fore tibiae and tarsi ferruginous *T. praestabilis*, Turn.
Fore tibiae wholly and fore tarsi mostly black *T. labilis*, Turn.
23. Tibiae and tarsi wholly bright fulvo-ferruginous 24.
Tibiae and at least a portion of the tarsi black; the tibiae rarely fusco ferruginous at the base 24.
24. Galea about half as long again as the scape *T. separabilis*, Turn.
Galea shorter than the scape 25.
25. Second sternite shining, with large sparse punctures; pubescence of the mesonotum fulvous, without any close-lying golden pubescence..... *T. testaceinerva*, Cam.
Second sternite subopaque, very minutely and closely punctured; mesonotum with gold or golden-grey hairs, with shorter close-lying golden pubescence 26.
26. Of small size, not exceeding 10 mm. in length, pygidial area elongate triangular, nearly twice as long as the greatest breadth, clothed with very pale golden pubescence *T. kristenseni*, Turn.
Of larger size, at least 12 mm. in length; pygidial area subtriangular, broad at the base, clothed with bright golden or dark reddish pubescence 27.
27. Eyes far apart on vertex, separated by a distance equal to at least the combined length of the second and third joints of the flagellum; pubescence of pygidial area rufo-fuscous..... *T. ugandensis*, Turn.
Eyes separated on the vertex by a distance not exceeding the combined length of the first and second joints of the flagellum; pubescence of pygidial area bright golden 28.
28. With five spines on the basal joint of the fore tarsus..... *T. tomentosa*, Kohl.
With six spines on the basal joint of the fore tarsus..... *T. neglecta*, Turn.
29. Basal joint of fore tarsus with six spines 30.
Basal joint of fore tarsus with not more than five spines 35.
30. Tergites more or less densely covered with golden pubescence, the apical fasciae distinct..... *T. aurichalcea*, Kohl.

- Pubescence of tergites silver or grey, and confined to the apical fasciæ 31.
31. Third sternite opaque, very closely and microscopically punctured 32.
- Third sternite shining, the punctures neither microscopic nor close 33.
32. Wings flavo-hyaline, costa fulvous; eyes separated on the vertex by a distance scarcely equal to the length of the two basal joints of the flagellum *T. erynnis*, Turn.
- Wings hyaline, costa fuscous; eyes separated on the vertex by a distance half as great again as the length of the second joint of the flagellum *T. inexorabilis*, Turn.
33. Vertex rugosely punctured; ventral segments 3-5 evenly punctured; thorax with dense fulvous pubescence *T. versutilis*, Turn.
- Vertex not rugosely punctured; ventral segments 3-5 sparsely and irregularly punctured; thorax with grey or golden-grey pubescence 34.
34. Pubescence of the thorax golden-grey; pygidial area broadly rounded at the apex *T. lachesis*, Turn.
- Pubescence of the thorax grey; pygidial area subacute at the apex *T. transvaalensis*, Cam.
35. Pubescence of the abdomen golden, of the pygidial area silver; pubescence of the abdomen not confined to the apical margin, but covering the whole dorsal surface *T. limetallica*, Turn.
- Pubescence of the abdomen confined to the apical fasciæ; silver or grey, except in rare varieties; pubescence of the pygidial area never silver 36.
36. Thorax punctured rugulose; median segment rugulose *T. notabilis*, Turn.
- Sculpture of thorax and median segment microscopic 37.
37. Eyes separated on the vertex by a distance scarcely equal to the length of the second joint of the flagellum *T. megæra*, Turn.
- Eyes separated on the vertex by a distance equal to the combined length of the two basal joints of the flagellum 38.
38. Vertex distinctly and rather sparsely punctured *T. instabilis*, Turn.
- Vertex almost smooth, the punctures microscopic 39.
39. Pubescence of thorax and median segment white; length 9-10 mm. *T. silverlocki*, Turn.
- Pubescence of thorax and median segment golden-grey; length 11-13 mm. *T. pulchricornis*, Turn.

Subgenus *Holotachytes*, subgen. nov.

Differs from typical *Tachytes* in the absence of the incision on the outer margin of the mandibles, in the striation of the dorsal surface of the median segment, and also in the longer and more rectangular shape of that segment.

Type of the subgenus, *Tachytes dichroa*, Sm.

Unlike *Calotachytes* this subgenus has the galea short and broadly rounded at the apex, not rostrate; and the joints of the labial palpi are short and stout.

1. *Tachytes (Holotachytes) dichroa*, Sm.

Tachytes dichroa, Sm. Cat. Hym. B.M. iv. p. 299 (1856). ♂.

Larrada ferox, Sm. Ann. & Mag. Nat. Hist. (4) xii. p. 294 (1873). ♀.

Hab. Gambia (type ♂); N. Nigeria, Oye River near Lajollo (*J. W. Scott-Macfie*); Gold Coast, N. Territories, Wa (*J. J. Simpson*), May.

Subgenus *Calotachytes*, subgen. nov.

The three following species—*T. marshalli*, Turn., *T. mira*, Kohl, and *T. admirabilis*, Turn.—form a section of the genus structurally distinguished by the five-jointed maxillary and three-jointed labial palpi, other species of the genus having six-jointed maxillary and four-jointed labial palpi. The basal joint of the labial palpi is extremely long and slender, much longer than the second joint of the flagellum, and the galea is very elongate. These two characters, however, are also present in *T. observabilis*, Kohl, *velox*, Sm., and other related species. I look on the difference in the number of the joints in the palpi as of subgeneric importance. The known species are confined to the Ethiopian region and are of large size, and have at least the four basal dorsal segments densely covered with golden or silver pubescence. The second sternite of the female is shining, with large sparse punctures.

Type of the subgenus, *Tachytes marshalli*, Turn.

In addition to the three Ethiopian species noticed below, *T. argyropis*, Sauss., from Madagascar, also belongs to the subgenus.

2. *Tachytes (Calotachytes) marshalli*, Turn.

Tachytes marshalli, Turn. Ann. & Mag. Nat. Hist. (8) ix. p. 420 (1912). ♀ ♂.

Hab. Mashonaland, Salisbury (*G. A. K. Marshall*);

Central Angoniland, Lilongwe district, 4000 ft. (*S. A. Neave*), May.

♂. The eighth sternite is subtruncate at the apex, the angles not projecting.

3. *Tachytes (Calotachytes) mira*, Kohl.

Tachytes mira, Kohl, Ann. Naturh. Hofmus. Wien, ix. p. 295 (1894). ♀.

♂. Seventh tergite very broadly rounded at the apex; eighth sternite emarginate, the angles forming distinct teeth.

Hab. Delagoa Bay (*Brauns*); Mashonaland, Salisbury (*G. A. K. Marshall*), January; Nyasaland, Mlanje (*S. A. Neave*), January to May.

4. *Tachytes (Calotachytes) admirabilis*, Turn.

Tachytes admirabilis, Turn, Ann. & Mag. Nat. Hist. (8) xvii. p. 444 (1916). ♀ ♂.

Hab. Uganda.

Possibly a local race of *mira*.

Subgenus *Tachytes*.

5. *Tachytes basilica*, Guér.

Lyropes basilicus, Guér. Iconogr. règn. anim. vii., Insect. p. 440 (1844).

♀.
Tachytes basilicus, Sm. Cat. Hym. B.M. iv. p. 300 (1856).

♀. Nigra; abdomine brunneo-ferrugineo, infra nigro intaminato; segmentis dorsalibus aureo-pubescentibus, pygidio aureo pubescente; mandibulis, antennis, femoribus apice, tibiis tarsisque fusco-ferrugineis; tegulis brunneis; alis subhyalinis, venis fuscis, apice leviter infuscatis.

♂. Feminae similis.

Long., ♀ 20 mm., ♂ 18 mm.

♀. Clypeus broadly subtruncate at the apex. Eyes separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum. Front clothed with silver-white pubescence. Thorax sparsely, median segment more thickly clothed with greyish pubescence; the punctures of the mesonotum minute and not distinctly separated; median segment nearly as long as the mesonotum, narrowed to the apex, with an ill-defined longitudinal

sulcus. Second sternite subopaque, minutely and closely punctured, with a shining subtriangular space on the middle of the apical margin. Pygidial area triangular, narrowly rounded at the apex. Basal joint of fore tarsi with six spines. First and third abscissæ of the radius subequal, each nearly twice as long as the second, and nearly half as long again as the space between the recurrent nervures on the cubitus. Third cubital cell on the cubitus extending a little beyond the apex of the radial cell.

♂. Eyes separated on the vertex by a distance not quite equal to half the length of the second joint of the flagellum; punctures of the second sternite distinctly larger than in the female; seventh tergite subtriangular, rounded at the apex, the apical angles not produced.

Hab. Senegal (*Guérin*); N. Nigeria, Zungeru (*J. W. Scott-Macfie*), November.

I am doubtful if Magretti (*Ann. Mus. Civ. Genova*, xxi. p. 586, 1884) has correctly identified the species he records from Kassala under this name.

6. *Tachytes observabilis*, Kohl.

Tachytes observabilis, Kohl, *Ann. Naturh. Hofmus. Wien*, ix. p. 295 (1894). ♂.

♀ ♂. Extremely near to *T. basilica*, Guér., differing in the black colour of the abdomen, legs, and antennæ in both sexes. The abdominal segments are very narrowly brown on the apical margin, and the gold pubescence on the abdomen is denser and deeper in colour than in *T. basilica*. The female has the clypeus very broadly rounded at the apex, not subtruncate as in *basilica*.

Hab. Zanzibar (*Kohl*); Nyasaland, Mlanje (*S. A. Neave*), December to February; British E. Africa, Kuja Valley, S. Kavirondo, 4000 ft. (*S. A. Neave*), April; Uganda Protectorate, Valley of Kafu River, Unyoro, 3400 ft. (*S. A. Neave*), December; Angola (*Monteiro*).

This is probably only a geographical race of *T. basilica*, ranging over Tropical E. Africa and the southern portion of Tropical West Africa. It occurs in Nyasaland with the very similar *T. mira*, Kohl, but may be distinguished at once by the very different sculpture of the second sternite of the female, and by the much greater approximation of the eyes on the vertex in the male; also by the number of joints in the palpi.

7. *Tachytes neavei*, sp. n.

♂. Niger; mandibulis in medio, tegulisque apice fuscis; tarsi fusco-ferrugineis; segmentis abdominalibus margine apicali brunneis, segmentis dorsalibus dense aureo-sericeis, fasciis apicalibus distinctis; alis subhyalinis, margine apicali leviter infumatis, venis ferrugineis.
Long. 18 mm.

♂. Clypeus broadly subtruncate at the apex; eyes very close together on the vertex, separated by a distance not exceeding the length of the first joint of the flagellum. Front and clypeus clothed with whitish pubescence. Second joint of the flagellum longer by about one-quarter than the third, joints 3-7 very distinctly arcuate beneath. Thorax clothed with greyish mingled with pale fulvous hairs, the punctures very minute. Median segment shorter than the mesonotum, but nearly twice as long as the scutellum. Second sternite very closely and finely punctured, more strongly in the middle than on the sides. Seventh tergite very broad, nearly as broad as the greatest length, very broadly rounded at the apex, rather thinly clothed with pale golden setæ, each of which springs from a large puncture; eighth sternite broadly and shallowly emarginate at the apex, the angles not forming distinct teeth. Third cubital cell not extending as far as the radial, scarcely more than half as long on the cubitus as the second, third abscissa of the radius a little longer than the second, about equal to the first.

Hab. Lualaba River, 2500-4000 ft. (*S. A. Neave*), May.

The eyes are even closer together on the vertex than in *observabilis*, but the anal segments are nearer to *mira*, though the seventh tergite is less distinctly rounded, and the eighth sternite less deeply emarginate than in that species. In the arcuate joints of the flagellum it differs from both species.

8. *Tachytes velox*, Sm.

Tachytes velox, Sm. Cat. Hymen. B.M. iv. p. 301 (1856).

♀. Closely resembles *T. basilica*, with which it occurs; but the antennæ are black; the abdominal segments are black, very narrowly brown on the apical margins, and the legs are black with the apical joints of the tarsi fusco-ferruginous. Eyes separated on the vertex by a distance equal to the length of the two basal joints of the flagellum;

median segment less than two-thirds as long as the mesonotum; second sternite shining, with large scattered punctures.

♂. Eyes separated on the vertex by a distance slightly exceeding three-quarters of the length of the second joint of the flagellum; clypeus very broadly rounded at the apex. Apical tergites and sternites as in *basilica*. Second ventral segment finely and closely punctured. The pubescence of the abdomen is paler than in *observabilis*.

Hab. Gambia (*Smith*); N. Nigeria, Zungeru (*J. W. Scott-Macfie*), November. ♀.

The median segment is shorter than in *basilica* and *observabilis*, and the eyes are farther apart on the vertex. The third and fourth joints of the flagellum are slightly arcuate beneath in the male.

9. *Tachytes perornata*, sp. n.

♂. Niger; mandibulis in medio, tegulis apice, calcaribus unguiculisque fusco-ferrugineis; alis subhyalinis, venis fuscis; capite albo-piloso, thorace griseo-piloso, segmentis abdominalibus apice anguste brunneis, segmentis dorsalibus dense aureo-pubescentibus; segmento ventrali octavo apice fortiter emarginato.

Long. 16 mm.

♂. Eyes separated on the vertex by a distance slightly exceeding three-quarters of the length of the second joint of the flagellum; clypeus broadly rounded at the apex; maxillary palpi six-jointed; labial palpi four-jointed, the two basal joints long and slender, the second about equal in length to the second joint of the flagellum, the first longer; puncturation of the vertex indistinct. Median segment nearly twice as long as the scutellum. Second sternite shining and rather strongly punctured in the middle, much more finely and closely on the sides. Seventh tergite rather broad, subtruncate broadly at the apex; eighth sternite widely and rather deeply emarginate, the apical angles produced.

Hab. Uganda Protectorate, Eastern Mbale District, South of Mt. Elgon, 3700 ft. (*S. A. Neave*), August; Mbale-Kumi Road, South of Lake Salisbury, 3700 ft. (*S. A. Neave*), August.

This is near *velox*, but has the seventh tergite broader, and the eighth sternite very different. The eyes are much further apart on the vertex than in *observabilis* or *neavei*. From *mira* it may be distinguished at once by the different number of joints in the palpi, and from *rhodesiana* by the

absence of teeth on the clypeus and the much deeper emargination of the eighth sternite.

10. *Tachytes nigropilosella*, Cam.

Liris nigropilosellus, Cam. Ann. Transvaal Mus. ii. p. 132 (1910).

Tachytes gigas, Bisch. Arch. f. Naturges. A. 3, p. 66 (1913). ♀.

♂. Seventh tergite rather broadly truncate, clothed with dark brown setæ, eighth sternite twice as long as broad, the sides parallel, the apex shallowly emarginate.

Hab. Natal, Durban (*Distant*); Mashonaland, Salisbury (*G. A. K. Marshall*), January, ♂ ♀; N.E. Rhodesia, Serenje district, 4500 ft. (*S. A. Neave*), December; Nyasaland, Mlanje (*S. A. Neave*), February.

11. *Tachytes natalensis*, Sauss.

Tachytes natalensis, Sauss. Mem. Soc. phys. & hist. nat. Genève, xiv. pt. 1, p. 21, n. 10, t. 1. fig. 4 (1854). ♂.

Tachytes natalensis, Sauss. Reise d. Novara, Zool. ii. pt. 1, Hymen. p. 68 (1867). ♂.

♀. Nigra; mandibulis in medio, tarsis anticis articulis tribus apicalibus, intermediis posticisque articulo apicali, tegulisque apice ferrugineis; fronte clypeoque argenteo-pubescentibus, area pygidiali aureo-setoso, alis fusco cæruleis, venis nigris.

♂. *Feminae similis*, tarsis anticis omnino ferrugineis.

Long., ♀ 17 mm., ♂ 14 mm.

♀. Clypeus truncate at the apex, with large sparse punctures, the space between the large punctures very minutely and closely punctured. Eyes separated on the vertex by a distance equal to twice the length of the third joint of the flagellum; second joint of the flagellum distinctly longer than the third. Head and thorax opaque, closely microscopically punctured; median segment opaque, narrowed to the apex, nearly as long as the mesonotum, a shallow sulcus on the apical quarter continued much more deeply on the apical truncation, which is coarsely transversely striated. Abdomen shining, the dorsal surface microscopically punctured; second sternite finely and closely punctured, with a shining and smooth triangular space on the middle of the apical margin. Pygidial area subtriangular, the sides a little longer than the base, the apex narrowly rounded, closely clothed with golden setæ which change in side lights to blackish. Basal joint of fore tarsi with five spines.

♂. Clypeus very broadly rounded at the apex; the

distance between the eyes a little less than in the female; seventh tergite rather broadly truncate at the apex; eighth sternite widely and very shallowly emarginate on the apical margin, the angles not produced into teeth. Third cubital cell rather short on the cubitus, not extending beyond the radial cell, third abscissa of the radius longer than the second.

Hab. Natal, Durban (*South African Museum*), April, ♀. One male from Natal in the British Museum.

12. *Tachytes memnon*, Turn.

Tachytes memnon, Turn. Ann. & Mag. Nat. Hist. (8) xvii. p. 446 (1916). ♀.

♀. Very close to *T. natalensis*, differing in the colour of the pubescence on the front and pygidial area, in the colour of the anterior tibiæ and of the base of the antennæ; in the distinctly longer second joint of flagellum, in the absence of large punctures on the clypeus, and in the distinctly narrower pygidial area.

Hab. Nyasaland, Mlanje (*S. A. Neave*), April.

Possibly a northern subspecies of *natalensis*.

13. *Tachytes præstabilis*, sp. n.

♀. Nigra; clypeo, fronte thoraceque pallide aureo-pubescentibus, pilis fulvidis intermixtis; segmentis dorsalibus 4 basalibus fascia apicali argenteo-pubescente; area pygidiali fusco-ferrugineo-setosa; tegulis testaceis; mandibulis fusco-ferrugineis; tibiis tarsisque anticis, calcaribus, unguiculisque ferrugineis; alis flavidulis, venis fusco-ferrugineis.

♂. Femiinæ similis; segmento dorsali septimo pallide et sparse ferrugineo-setoso.

Long., ♀ 15-16 mm., ♂ 13 mm.

♀. Clypeus closely and finely punctured, with large punctures intermixed, deflexed towards the apical margin, which is subtruncate with a distinct tooth on each side; vertex with a few fairly large, scattered punctures; eyes separated on the vertex by a distance slightly exceeding the length of the second joint of the flagellum. Galere very long and narrow at the apex, rostrate. Basal joint of fore tarsus with six spines. Median segment half as long again as the scutellum, the median sulcus almost obsolete on the dorsal surface. Second sternite minutely and closely punctured; pygidial area broadly triangular, narrowly rounded at the apex. Third cubital cell extending a little beyond the apex of the radial cell.

♂. Seventh tergite very broadly truncate at the apex ; eighth sternite very widely but rather shallowly emarginate, the apical angles produced into short acute spines.

Hab. Uganda Protectorate, Unyoro, Bugoma Forest, 3700 ft. (*S. A. Neave*), December ; Unyoro, Budongo Forest, 3400 ft. (*S. A. Neave*), December.

Closely allied to *T. hamiltoni*, but differs in the colour of the legs and wings, and in the greater distance between the eyes on the vertex.

14. *Tachytes labilis*, sp. n.

♀. Nigra ; tarsis articulis tribus apicalibus subtus, calcaribusque fusco-ferrugineis ; tegulis testaceis ; fronte clypeoque griseo-argenteo-pubescentibus ; thorace segmentoque mediano fulvo-pilosis ; segmentis dorsalibus 4 basalibus fascia lata apicali griseo-argenteo-pubescente ; area pygidiali fusco-ferrugineo-setosa ; alis hyalinis, pallidissime flavo-tinctis, apice pallide infuscatiss, venis testaceis ; galea elongata.

♂. Feminæ similis ; segmento dorsali septimo subargenteo-pubescente.

Long., ♀ 18 mm., ♂ 15 mm.

♀. Extremely near to *T. præstabilis*, but differs in having the pygidial area a little more broadly rounded at the apex ; and in the colour of the fore legs ; the eyes are also a little further apart on the vertex.

♂. Seventh dorsal segment broadly rounded at the apex, not truncate ; eighth sternite narrow, not more than half as wide as in *præstabilis*, shallowly emarginate at the apex, the apical teeth blunter than in *præstabilis*.

Hab. Nyasaland, Mlanje (*S. A. Neave*), December to February.

Probably only a geographical race of *præstabilis*, but the difference in the apical segments of the male seems important. The male is the type.

15. *Tachytes hamiltoni*, sp. n.

♂. Niger ; fronte clypeoque aureo-pubescentibus ; thorace segmentoque mediano pallide fulvo-hirsutis, mesonoto lateribus pallide aureo-pubescente ; segmentis dorsalibus 5 basalibus fascia apicali argenteo-pubescente, pygidio rufo-pubescente ; tegulis testaceis ; mandibulis basi, femoribus parte apicali, tibiis tarsisque ferrugineis ; alis flavo-hyalinis, venis ferrugineis.

Long. 15 mm.

♂. Clypeus very shallowly emarginate at the extreme apex, with three small but distinct teeth on each side; vertex minutely and rather sparsely punctured; eyes separated on the vertex by a distance equal to the length of the second joint of the flagellum; median segment more than half as long again as the scutellum, with a distinct longitudinal sulcus on the dorsal surface; ventral segments of the abdomen finely and evenly, but not very closely punctured; seventh tergite very broadly truncate at the apex, clothed with dark red gold pubescence; eighth sternite very broadly and rather shallowly emarginate, the apical angles produced into teeth. Basal joint of the fore tarsus with six spines. Second and third abscissæ of the radius subequal, both rather shorter than the space between the recurrent nervures on the cubitus; third cubital cell a little shorter on the cubitus than the second. Third joint of labial palpi slender, as long as the second.

Hab. British East Africa, 30 miles from Magadi Junction (*F. G. Hamilton*), April; Simba, 3350 ft. (*S. A. Neave*), April; East shore of Victoria Nyanza near Karungu (*S. A. Neave*), April.

Very near *T. separabilis*, but differs in the much broader seventh tergite and eighth sternite, and in the slightly greater distance between the eyes on the vertex; the recurrent nervures are also further apart, and the galea is longer.

16. *Tachytes simulatrix*, sp. n.

♀. Nigra; scapo apice subtus, mandibulis basi, tegulis, femoribus dimidio apicali, tibiis tarsisque ferrugineis; fronte clypeoque pallidissime aureo-pubescentibus; thorace segmentoque mediano fulvo-hirsutis; segmentis dorsalibus 4 basalibus fascia apicali argenteo-pubescente; area pygidiali rufo-setosa; alis flavo-hyalinis, venis ferrugineis; galea maxime elongata, scapo triplo longiore.

Long. 16 mm.

♀. Clypeus very broadly rounded or subtruncate at the apex; galea very long and narrow, at least three times as long as the scape; second joint of labial palpi longer than the third. Vertex sparsely and not very finely punctured; eyes separated on the vertex by a distance slightly exceeding the length of the second joint of the flagellum. Basal joint of the fore tarsus with six spines. Median segment less than half as long again as the scutellum, with a distinct median sulcus; pygidial area broadly triangular, rounded

at the apex; spur of hind tibia as long as the basal joint of the hind tarsus. Third cubital cell on the cubitus reaching beyond the radial cell, about three-quarters of the length of the second cubital cell. Second and third abscissæ of the radius subequal. Second ventral segment subopaque, closely microscopically punctured.

Hab. S. Nigeria, Okigwi (*J. J. Simpson*), May.

This species is nearly allied to *T. hamiltoni*, but has the galea much longer, fully three times as long as the scape in *simulatrix*, only a little more than twice as long in *hamiltoni*. As this character does not appear to differ in the sexes of other species, I do not think that these can be sexes of one species.

17. *Tachytes rhodesiana*, Bisch.

Tachytes rhodesianus, Bisch. Arch. f. Naturges. A. 3, p. 70 (1913). ♀.

♀. Very similar to *T. observabilis*, but somewhat smaller, and may be distinguished at once by the clypeus, which is depressed on the apical margin, very shallowly subemarginate in the middle, with three well-defined teeth on each side. The distance between the eyes on the vertex is somewhat greater, slightly exceeding the length of the second joint of the flagellum. The sculpture of the second ventral segment resembles that of *observabilis* and *basilica*, but the minute punctures spread over the small triangular area in the middle of the apical margin.

♂. Clypeus as in the female. Eyes separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum, much further apart than in *observabilis* and *basilica*. Seventh tergite broad, rather broadly subtruncate at the apex, eighth sternite very shallowly emarginate at the apex, the angles not forming distinct teeth. Fourth and fifth joints of the flagellum subarcuate beneath.

Length, ♀ 17 mm., ♂ 16 mm.

Hab. S. Rhodesia, Springvale (*Rhodesia Museum*), April; Zululand, Mfongosi (*W. E. Jones, S. African Museum*), April, ♂ ♀.

The labial palpi in this species are much shorter and stouter than in others of the group, the basal joint being much shorter than the second joint of the flagellum, not longer as in *observabilis* and other related species.

*18. *Tachytes pulchrivestita*, Cam.

Tachytes pulchrivestita, Cam. Sjöstedt. Kilimandjaro-Meru Exp. ii. p. 284 (1910). ♀.

Hab. Usambara.

From the description this appears to be nearest to *T. rhodesiana*.

19. *Tachytes aurichalcea*, Kohl.

Tachytes aurichalcea, Kohl, Ann. Soc. Entom. Belg. xxxv. p. 15 (1891). ♀.

♀. Nigra; tarsi apice fusco-ferrugineis; tegulis testaceis; alis hyalinis, venis testaceis; fronte clypeoque argenteo-pubescentibus; thorace, segmento mediano, segmentis abdominalibus dorsalibus, pedibusque aureo-pubescentibus; area pygidiali fusco-ferrugineo-pubescente.

♂. Feminae similis.

Long., ♀ 15 mm., ♂ 14 mm.

♀. Vertex sparsely and rather finely punctured; eyes separated on the vertex by a distance equal to the length of the two basal joints of the flagellum. Punctures of the thorax very minute; median segment short, less than half as long again as the scutellum. The golden pubescence of the tergites very short and rather sparse at the base, much denser on the apical fasciae. Pygidial area triangular, narrowly rounded at the apex. Second and third sternites subopaque, minutely and very closely punctured. Galea about as long as the scape. Six spines on the basal joint of the fore tarsus.

♂. Eyes separated on the vertex by a distance distinctly less than the length of the second joint of the flagellum; seventh tergite rather broadly rounded at the apex; eighth sternite shallowly emarginate in the middle, the apical angles blunt.

Hab. N. Nigeria, Bokani (*J. J. Simpson*), September; Sierra Leone, Daru (*J. J. Simpson*), August; Gold Coast, Northern Territories, Yapi (*J. J. Simpson*); S. Nigeria, Okigwi (*J. J. Simpson*), May; Katanga, Kambove, 4000-5000 ft. (*S. A. Neave*), March; Nyasaland, Mlanje (*S. A. Neave*), December to July; N. Rhodesia, Ulunga, (*F. V. Bruce Miller*), May; Mashonaland, Salisbury (*G. A. K. Marshall*), April.

20. *Tachytes bimetallica*, sp. n.

♀. Nigra; tarsi ferrugineis, articulo basali infuscato; calcaribus ferrugineis; tegulis segmentisque abdominalibus margine apicali brunneo-testaceis; alis hyalinis, venis testaceis; clypeo, fronte, pygidioque argenteo-pubescentibus; thorace cinereo-hirsuto; segmentis dorsalibus 1-5 pallide aureo-pubescentibus.

Long. 13 mm.

♀. Clypeus subtruncate at the apex, with three minute teeth on each side. Vertex very minutely and closely punctured; eyes separated on the vertex by a distance equal to the combined length of the two basal joints of the flagellum. Median segment scarcely half as long again as the scutellum, with a distinct longitudinal sulcus on the dorsal surface. Basal joint of the fore tarsus with five spines; fore tibia with a row of five very long spines; spur of hind tibia as long as the basal joint of the hind tarsus. Pygidial area triangular, narrowly rounded at the apex. Third and fourth sternites shining and sparsely punctured in the middle.

Hab. Cape, Hex River (*South African Museum*), January.

Nearly allied to *aurichalcea*, but differs in the colour of the pubescence on the thorax and pygidial area, and in the number of spines on the fore metatarsus.

21. *Tachytes mærens*, sp. n.

♀. Nigra, albo-pilosa; calcaribus spinisque tarsorum ferrugineis fronte clypeoque albido-pilosis; segmentis dorsalibus 4 fascia apicali interrupta argenteo-pubescente, area pygidiali basi fusco, apice aureo-setosa; alis fuscis, venis nigris.

Long. 17-20 mm.

♀. Clypeus clothed with long silver hairs, which change to dull brown in some lights; the extreme apical margin narrowly depressed, subemarginate at the extreme apex, with three rather ill-defined teeth on each side. Lower part of the front clothed with long silver hairs as on the clypeus; vertex very distinctly and rather sparsely punctured. Eyes separated on the vertex by a distance equal to the combined length of the two basal joints of the flagellum; antennæ short and stout. Thorax minutely and very closely punctured, the punctures distinctly separated, median segment more closely punctured, the pubescence cinereous. Abdomen shining, the dorsal surface closely and minutely punctured; the fifth segment more distinctly punctured,

the apical margin arcuately depressed, with a few long fuscous hairs at the base of the depression. Second sternite rather sparsely and not very finely punctured, shining. Pygidial area clothed with fuscous setæ, which change to reddish gold in some lights, especially at the apex; triangular, narrowly rounded at the apex. Basal joint of the fore tarsus with six spines. Third cubital cell extending distinctly beyond the apex of the radial cell; third abscissa of the radius a little longer than the second, but shorter than the first.

Hab. Nyasaland, Mlanje (*S. A. Neave*), December.

Superficially rather like *T. marshalli*, Turn., but the second sternite is much more closely and finely punctured, the silver pubescence on the abdomen is not nearly so extensive, and the third cubital cell is much longer on the cubitus. But *marshalli* belongs to the group with elongate palpi.

22. *Tachytes distanti*, sp. n.

♀. Nigra, argenteo-pilosa; tarsi ferrugineis, articulo basali supra nigro; capite, thorace, segmento medio albedo-pilosis, mesonoto scutelloque pallide fulvo-griseo-pilosis; segmentis dorsalibus dense argenteo-pubescentibus, fasciis apicalibus distinctis; area pygidiali argenteo-pilosa; segmentis ventralibus apice anguste brunneis; alis subhyalinis, pallidissime flavidulis; venis ferrugineis.

Long. 14 mm.

♀. Clypeus broadly rounded at the apex, the anterior margin narrowly depressed and very shallowly emarginate in the middle. Eyes separated on the vertex by a distance slightly less than the combined length of the two basal joints of the flagellum. Front and clypeus with shining silver pubescence, with long whitish hairs intermingled; pleuræ and median segment clothed with long whitish hairs, the dorsal surface of the thorax clothed with short erect greyish-fulvous hairs. Dorsal segments densely covered with silver pubescence; pygidial area triangular, almost pointed at the apex, clothed with silver pubescence slightly tinged with gold. Second sternite subopaque finely and closely punctured. Basal joint of the fore tarsus with five long pale spines. Radial cell pointed at the apex, the appendicular cell very narrow; third cubital cell extending on the cubitus beyond the apex of the radial cell, nearly three-quarters of the length of the second cell on the cubitus. First abscissa of the radius a little longer than the third, second less than two-thirds of the length of the third, the

distance between the recurrent nervures on the cubitus slightly greater than the second abscissa of the radius.

Hab. Pretoria (*Distant*).

Very nearly related to *T. argenteovestita*, Cam., and *T. buluwayoensis*, Bisch., but differs from both in only having five spines on the basal joint of the fore tarsus, instead of six as in those species; it also differs from *buluwayoensis* in the colour of the pubescence on the pygidial area; and from *argenteovestita* in the colour of the tarsi and in details of neururation.

*23. *Tachytes buluwayoensis*, Bisch.

Tachytes buluwayoensis, Bisch. Arch. f. Naturges. A. 3, p. 68 (1913).

♀.

♀. Differs from *distanti* in having six spines on the basal joint of the fore tarsus, and in having the pygidial area clothed with reddish-brown setæ.

Hab. S. Rhodesia, Bembesi; January.

*24. *Tachytes argenteovestita*, Cam.

Tachytes argenteovestita, Cam. Ann. Transvaal Mus. ii. p. 130 (1910).

♀.

Differs from *distanti* in having six spines on the basal joint of the fore tarsus, and in the much shorter second abscissa of the radius, also apparently in the colour of the tarsi.

I am doubtful if *buluwayoensis* is really distinct from *argenteovestita*, the details of neururation as to the comparative length of the abscissæ of the radius being very unreliable in this genus, and the other differences given by Bischoff may be due to very slight inaccuracies in Cameron's description.

Hab. Transvaal, Pietersburg; December.

25. *Tachytes dilaticornis*, Turn.

Tachytes dilaticornis, Turn. Ann. & Mag. Nat. Hist. (8) xvii. p. 446 (1916). ♂.

♀. Nigra; capite argenteo-pubescente; thorace segmentoque mediano pallide et sparse aureo-pilosis; abdomine liete aureo-pubescente, segmentis dorsalibus fascia apicali densius aureo-pubescente, segmentis dorsalibus et ventralibus apice late brunneis; tegulis fuscis; alis flavis, apice latissimo infumatis, venis testaceis.

♂. *Feminae similis*; capite pallide aureo-pubescente; flagello-articulis 2-7 infra fortiter arcuato-dilatatis.

Long., ♂ ♀, 14 mm.

♀. Clypeus subtruncate at the apex. Eyes separated on the vertex by a distance not quite equal to the length of the two basal joints of the flagellum. Pubescence of the thorax very sparse and pale, longer on the sides of the median segment. Abdomen rather slender, the basal segment not quite as broad as the second; second sternite opaque, minutely and closely punctured, with sparse larger punctures; pygidial area elongate-triangular, narrowly rounded at the apex, clothed densely with reddish gold pubescence. Basal joint of fore tarsus with five spines.

♂. Eyes separated on the vertex by a distance equal to the length of the third joint of the flagellum; seventh tergite truncate at the apex, the sides convergent from the base; eighth sternite broadly subtruncate at the apex, the apical angles not produced.

Hab. British East Africa, Kuja Valley, S. Kavirondo, 4000 ft. (*S. A. Neave*). April 30-May 1, ♂; Uganda Protectorate, between Kumi and N.E. shore of Lake Kioga, 3400-3600 ft. (*S. A. Neave*), August.

This is near *T. aurichalcea*, Kohl, but is a more slender species, with differently coloured wings, and also differs in the clypeus, the slightly narrower space between the eyes, and in the male antennae and apical segments. This belongs to the section of the genus in which the galea is short and broadly rounded, not rostrate.

26. *Tachytes volubilis*, sp. n.

♂. Niger; segmentis abdominalibus margine apicali brunneis; calcaribus unguiculisque ferrugineis; fronte clypeoque subargenteo-pubescentibus; thorace segmentoque mediano sparse et pallide aureo-griseo-pubescentibus; segmentis dorsalibus aureo-pubescentibus, fasciis apicalibus distinctissimis; alis flavo-hyalinis, venis ferrugineis.

Long. 12 mm.

♂. Clypeus very broadly rounded at the apex; galea much shorter than the scape; vertex rather indistinctly punctured; eyes separated on the vertex by a distance slightly exceeding the length of the second joint of the flagellum. Thorax very closely and minutely punctured; median segment finely rugulose, twice as long as the scutellum. Abdomen rather slender; second sternite

subopaque, finely and closely punctured; seventh dorsal segment rather long, rounded at the apex, and clothed with pale golden pubescence; eighth ventral segment rounded at the apex.

Hab. British East Africa, Kuja Valley, S. Kavirondo, 4000 ft. (*S. A. Neave*), April; Masai Reserve (*T. J. Anderson*), April.

Near *T. dilaticornis*, Turn., but differs in the structure of the antennæ, the greater distance between the eyes, the narrower apical segments, and the colour of the wings.

27. *Tachytes nudiventris*, sp. n.

♀. Nigra; fronte clypeoque pallide fulvo-pilosis; thorace segmento medio sparse griseo-pilosis; abdomine nudo, nitido; alis hyalinis, flavo suffusis, venis fuscis; area pygidiali nigrosetosa; palpis testaceis.

♂. Femine simillimus.

Long., ♀ 15 mm., ♂ 14 mm.

♀. Clypeus finely and closely punctured, broadly rounded at the apex. Eyes separated on the vertex by a distance equal to the combined length of the first and second joints of the flagellum. Thorax and median segment opaque, very finely and closely punctured, rather more sparsely on the scutellum than elsewhere; the median segment as long as the scutellum and postscutellum combined, rounded at the posterior angles, very steeply sloped posteriorly, with a narrow and shallow median sulcus broadening on the apical third and continued more deeply on the apical truncation. Abdomen shining, minutely punctured, the segments without apical bands of pubescence; second sternite closely and minutely punctured, with an arched row of large punctures before the apex. Pygidial area broad at the base, narrowly rounded at the apex, subtriangular, clothed with black setæ. Basal joint of the fore tarsi with six short and stout spines. Second and third abscissæ of the radius almost equal, the distance between the recurrent nervures on the cubitus equal to the second abscissa of the radius. Third cubital cell long and narrow, the apex on the cubitus reaching nearer to the margin of the wing than the apex of the radial cell.

♂. Seventh tergite small, rather narrowly rounded at the apex; eighth sternite about half as long again as broad, narrowly and not very deeply incised at the apex. Galea rather short and broad, not rostrate.

Hab. Uganda, Entebbe (*C. G. Gowdey*), June to November; Uganda Protectorate, Mpanga Forest, Toro, 4800 ft. (*S. A. Neave*), November; N. Ruwenzori, 6000–8500 ft. (*S. A. Neave*), November; Tero Forest, S.E. Buddu, 3800 ft. (*S. A. Neave*), September.

28. *Tachytes ambidens*, Kohl.

Tachytes ambidens, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. p. 343 (1884). ♀.

♀. Nigra; mandibulis, tarsis calcaribusque ferrugineis; abdomine segmentis duobus basalibus rufis, nigro intaminatis; segmentis tribus dorsalibus apice utrinque fascia transversa argenteo-pilosa; pygidio fusco-ferrugineo piloso; alis hyalinis, venis tegulisque testaceis.

♂. Feminae similis; pygidio argenteo-piloso.

Long., ♀ 11 mm., ♂ 9 mm.

♀. Head seen from the front much broader than long; front clothed with white pubescence. Clypeus with a short longitudinal carina on each side near the middle of the apical margin, the carinae projecting and forming short teeth. Eyes separated on the vertex by a distance fully equal to the length of the two basal joints of the flagellum. Thorax finely and closely punctured, the sides of the thorax and the median segment sparsely clothed with white hairs. Second sternite closely and minutely punctured, the apical margin smooth and shining. Pygidial area subtriangular, rather broadly rounded at the apex. Basal joint of the fore tarsi with five spines. Radial cell rather broadly truncate at the apex, not reaching nearly as far as the cubitus; second and third abscissæ of the radius and the space between the recurrent nervures all subequal.

♂. Clypeus without carinae or teeth, the anterior margin broadly truncate. Seventh tergite broad, rather broadly subtruncate at the apex; eighth sternite widely and not very shallowly emarginate at the apex, produced into a tooth on each side at the apical angles.

Hab. The South-west borders of Abyssinia, or the adjacent districts of British East Africa (*R. J. Stordy*). Described by Kohl from Sarepta in S.E. Russia.

A pair in the British Museum from the Stordy collection. The female answers well to Kohl's description in most details, but the eyes seem to be slightly further apart on the vertex, and the antennæ are as stout as in *T. europæa*.

*29. *Tachytes sjöstedti*, Cam.

Tachytes sjöstedti, Cameron, Sjöstedt, Kilimandjaro-Meru Exped. ii. p. 284 (1910). ♀.

Hab. Meru.

Unknown to me.

30. *Tachytes separabilis*, sp. n.

♀. Nigra; mandibulis basi, scapo subtus, tegulis, femoribus dimidio apicali, posticis fere totis, tibiis tarsisque fulvo-ferrugineis; fronte clypeoque pallide aureo-pubescentibus; mesonoto lateribus pallide aureo-pubescente, segmento mediano pallide fulvo-hirto; segmentis dorsalibus 4 basalibus fascia lata apicali argenteo-pubescente, area pygidiali aureo-pubescente; alis flavo-hyalinis, venis ferrugineis.

♂. Feminae similis, segmento dorsali septimo argenteo-pubescente. Long., ♀ ♂, 15-16 mm.

♀. Clypeus broadly truncate at the apex; galea half as long again as the scape; second and third joints of the labial palpi subequal. Vertex with a few scattered punctures; eyes separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum. Basal joint of the fore tarsi with six spines; spur of the hind tibia as long as the basal joint of the hind tarsus. Median segment not quite half as long again as the scutellum, the median sulcus obsolete on the dorsal surface. Second sternite subopaque, minutely and closely punctured; pygidial area triangular, rather broadly rounded at the apex. Third cubital cell a little more than half as long on the cubitus as the second, extending a little further than the apex of the radial cell.

♂. Eyes separated on the vertex by a distance very distinctly less than the length of the second joint of the flagellum. Seventh tergite rather broadly truncate at the apex; eighth sternite emarginate, the apical angles bluntly produced.

Hab. Transvaal, Pretoria (*Distant*), ♀; Zululand, Mfongosi (*W. E. Jones*), ♂, in South African Museum; British East Africa, Kuja Valley, S. Kavirondo, 4000 ft. (*S. A. Neave*), ♂, May; Gold Coast, N. Territories, Yapi (*J. J. Simpson*), ♀, December.

This closely resembles *T. etrusca*, Rossi, but in that species the galea is no longer than the scape. Radoszkowski's record of *T. etrusca* from Angola probably refers to this species.

31. *Tachytes irritabilis*, sp. n.

♂. Niger; segmentis abdominalibus margine apicali anguste brunneis; tegulis testaceis; femoribus apice extremo, tibiis tarsisque fulvo-ferrugineis; alis flavo-hyalinis, venis ferrugineis; fronte clypeoque pallide aureo-pubescentibus; thorace segmentoque mediano griseo-aureo-pubescentibus; segmentis dorsalibus 4 basalibus fascia interrupta apicali argenteo-pubescente; area pygidiali pallide aureo-pubescente; galea modice elongata, scapo dimidio longiore.

Long. 11 mm.

♂. Clypeus very broadly rounded at the apex, with three minute teeth on each side; vertex rather closely punctured; eyes separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum; second and third joints of the labial palpi subequal. Thorax closely microscopically punctured; median segment about half as long again as the scutellum. Second sternite finely but not very closely punctured, thinly clothed with long fulvous hairs; seventh tergite broadly rounded at the apex; eighth ventral segment strongly emarginate, the apical angles bluntly produced. Basal joint of fore tarsi with four spines; spur of hind tibiae as long as the basal joint of the hind tarsus. Radial cell narrowly rounded at the apex; third abscissa of the radius a little longer than the second, but slightly shorter than the space between the recurrent nervures on the cubitus.

Hab. Nyasaland, Mlanje (*S. A. Neave*), December.

In the length of the galea this species is nearly allied to *T. separabilis*, from which it is separated by the smaller size, the rounded apex of the seventh tergite, and the lesser number of spines on the basal joint of the fore tarsus. In the latter case it is possible that the normal number of spines in this species may be five, as they are liable to be broken, but certainly not six as in *separabilis*.

32. *Tachytes testaceinerva*, Cam.

Tachytes testaceinerva, Cameron, Sjöstedt, Kilimandjaro-Meru Exp. ii. p. 283 (1910). ♀.

♀. Nigra, mandibulis basi, scapo subtus, tegulis, femoribus apice, tibiis tarsisque ferrugineis; fronte clypeoque fulvo-aureo-pubescentibus; thorace segmentoque mediano dense fulvo-pubescentibus; segmentis dorsalibus 4 basalibus apice late argenteo-pubescentibus; area pygidiali rufescente-pilosa; alis pallide fulvo-hyalinis, venis testaceis.

♂. Feminae similis.

Long., ♀ 17-20 mm., ♂ 18 mm.

♀. Eyes separated on the vertex by a distance equal to the length of the third joint of the flagellum. Clypeus broadly subtruncate at the apex; vertex with sparse distinct punctures; second joint of the flagellum distinctly longer than the third. Pygidial area subtriangular, rather broadly rounded at the apex, clothed with dark reddish pubescence, which changes to fuscous in some lights. Second sternite shining deeply and sparsely punctured, with a smooth triangular area in the middle of the apical margin. Third abscissa of the radius longer than the second by about one-quarter, equal to the distance between the recurrent nervures on the cubitus. Basal joint of fore tarsus with six spines.

♂. Eyes separated on the vertex by a distance equal to the length of the first joint of the flagellum; antennæ rather stout, the third to sixth joints of the flagellum feebly arcuate beneath. Scutellum rather more distinctly punctured than the mesonotum; seventh tergite subtriangular, rather narrowly truncate at the apex, clothed with red gold pubescence. Eighth sternite truncate at the apex, the angles not produced.

Hab. Meru lowlands, Ngare na Nyuki (*Sjöstedt*), November, ♀; Nyasaland, Mlanje (*S. A. Neave*), February, ♀; S.E. shore of Lake Nyasa between Ft. Maguire and Ft. Johnston (*S. A. Neave*), March, ♂.

My description is taken from a pair from Nyasaland, which I think belong to Cameron's species, but I have not examined the type.

33. *Tachytes associata*, sp. n.

♂. Niger; tegulis, femoribus apice, tibiis tarsisque ferrugineis; fronte clypeoque aureo-pilosis; thorace segmentoque mediano dense et pallide fulvo-pilosis, mesonoto lateribus aureo-pubescente, segmentis dorsalibus 1-5 apice fascia argenteo-pubescente; area pygidiali pallide aureo-pubescente; alis pallidissime fulvo-hyalinis, nervis testaceis.
Long. 15 mm.

♂. Near *testaceinerva*, Cam., but the clypeus is very narrowly depressed on the apical margin, the depressed portion slightly porrect and with a distinct angle in the middle; vertex not distinctly punctured; eyes separated on the vertex by a distance equal to the length of the second joint of the flagellum; basal joint of fore tarsi with five spines; second ventral segment finely and evenly punctured, subopaque, not shining with sparse large punctures on the apical half as in *testaceinerva*; seventh tergite broad, truncate

broadly at the apex; eighth sternite broad, shallowly bisinuate at the apex, the apical angles not produced. Third abscissa of the radius nearly twice as long as the second, the latter nearly as long as the space between the recurrent nervures on the cubitus. Third cubital cell extending on the cubitus a little beyond the apex of the radial cell.

Hab. Portuguese E. Africa, Beira (*P. A. Sheppard*).

The broad, bisinuate, eighth sternite distinguishes this species from all others of similar colouring.

34. *Tachytes kristenseni*, sp. n.

♀. Nigra; capite subargenteo-pubescente; thorace segmentoque mediano sparse griseo-aureo-pubescentibus, abdomine griseo-aureo-pubescente, segmentis dorsalibus 4 basalibus fasciis apicalibus distinctis; area pygidiali angusta, pallidissime aureo-pubescente; tegulis testaceis, segmentis abdominalibus margine apicali anguste brunneis; tibiis, tarsis, femoribusque posticis ferrugineis; alis hyalinis, venis fusco-ferrugineis.

Long. 9 mm.

♀. Eyes separated on the vertex by a distance equal to the length of the two basal joints of the flagellum; clypeus subtruncate at the apex, the apical margin rather broadly depressed; antennæ short, the basal joint of the flagellum fully half as long as the second, which is a little shorter than the third; vertex not distinctly punctured. Median segment about half as long again as the scutellum, without a longitudinal sulcus on the dorsal surface. Abdomen rather slender, thinly clothed with short, dull, pale golden pubescence, which is denser and brighter on the marginal fasciæ. Pygidial area narrow, nearly twice as long as the greatest breadth, narrowly rounded at the apex. Second sternite minutely and closely punctured. Only three slender spines visible on the basal joint of the fore tarsus. Second abscissa of the radius very little shorter than the third, longer than the distance between the recurrent nervures on the cubitus. Third cubital cell much more than half as long as the second on the cubitus, extending further than the apex of the radial cell.

Hab. Abyssinia, Harar (*G. Kristensen*), May.

Described from a single specimen. It is possible that the spines on the fore tarsus may have been broken off on the basal part, but the specimen is in good condition and shows no signs of damage. The species may be distinguished by the narrow pygidial area, the short joints of the flagellum, and the small and slender form.

35. *Tachytes ugandensis*, sp. n.

♀. Nigra, capite, thorace, segmentoque mediano pallide aureo-pubescentibus; segmentis dorsalibus 4 basalibus apice fascia subargenteo-pubescente; area pygidiali rufo-fusco-setosa; mandibulis fusco-ferrugineis; tegulis, femoribus apice, tibiis tarsisque fulvo-ferrugineis; alis hyalinis, venis testaceis.

♂. Feminae simillimus.

Long., ♂ ♀, 13 mm.

♀. Eyes separated on the vertex by a distance slightly exceeding the combined length of the second and third joints of the flagellum; the vertex very distinctly and rather sparsely punctured. Front and clypeus clothed with very pale golden pubescence, the clypeus very broadly triangularly depressed at the apex, the margin subtruncate. Second joint of the flagellum distinctly longer than the third. Thorax rather sparsely clothed with pale golden pubescence and with longer pale fulvous hairs; median segment not more than half as long again as the scutellum, with a shallow longitudinal impressed line, which is more deeply continued on the posterior slope. Abdomen, including the second sternite, minutely and closely punctured; pygidial area subtriangular, rather narrowly rounded at the apex. Basal joint of the fore tarsus with seven rather slender spines. Third abscissa of the radius half as long again as the second, but scarcely equal to the distance between the recurrent nervures on the cubitus. Third cubital cell on the cubitus less than half as long as the second.

♂. Seventh tergite not very broad, rounded at the apex; eighth sternite deeply and rather narrowly emarginate at the apex. The galea is short in both sexes, not very much longer than the greatest breadth, broadly rounded at the apex; the ligula is broadly extended and bilobed; second joint of labial palpi no longer than the third.

Hab. Uganda, Entebbe (*C. G. Gowdey*), June to January; Mariba Forest, Chagwe, 3500–3800 ft. (*S. A. Neave*), July.

This species is easily distinguished from others of similar colouring by the great distance between the eyes on the vertex.

36. *Tachytes opposita*, sp. n.

♂. Niger; fronte clypeoque aureo-pubescentibus; thorace segmentoque mediano griseo-aureo-pubescentibus; segmentis dorsalibus 4 basalibus fascia apicali argenteo-pubescente; tegulis testaceis;

tibiis tarsisque ferrugineis; alis hyalinis, pallidissime flavo-tinctis, venis ferrugineis.

Long. 13 mm.

♂. Clypeus very broadly rounded at the apex; vertex sparsely punctured. Eyes separated on the vertex by a distance only slightly exceeding half the length of the second joint of the flagellum; median segment about half as long again as the scutellum. Second sternite shining, evenly, but not very closely punctured; seventh tergite broadly subtriangular, rather broadly truncate at the apex, and clothed with silver pubescence faintly tinged with gold; eighth sternite widely and rather shallowly emarginate, the angles produced into distinct teeth. Third abscissa of the radius longer than the second, but shorter than the distance between the recurrent nervures on the cubitus. Third cubital cell very little shorter on the cubitus than the second. Basal joint of fore tarsus with five spines.

Hab. N. Rhodesia, Pakasa (*O. Silverlock*), January.

37. *Tachytes neglecta*, sp. n.

♀. Nigra; fronte clypeoque subargenteo-pubescentibus; thorace fulvo-pubescente; segmento mediano griseo-fulvo-hirsuto; segmentis dorsalibus 4 basalibus fascia apicali griseo-argenteo-pubescente; area pygidiali apice subacuta, aureo-pubescente; tegulis testaceis; segmentis abdominalibus margine apicali brunneis; tibiis tarsisque ferrugineis; alis hyalinis, pallide flavo-tinctis, venis testaceis.

♂. *Feminae similis.*

Long., ♀ 12-14 mm., ♂ 13-14 mm.

♀. Clypeus very broadly rounded at the apex; vertex sparsely and shallowly punctured; eyes separated on the vertex by a distance equal to the combined length of the first and second joints of the flagellum. Median segment less than half as long again as the scutellum, the median sulcus indistinct. Second ventral segment subopaque, very minutely and closely punctured; pygidial area subacute at the apex. Third abscissa of the radius longer than the second, about equal to the distance between the recurrent nervures on the cubitus; third cubital on the cubitus at least two-thirds of the length of the second. Basal joint of fore tarsus with six spines.

♂. Eyes separated on the vertex by a distance slightly exceeding the length of the second joint of the flagellum; seventh tergite very broadly rounded at the apex, clothed

with golden pubescence; eighth sternite deeply and rather narrowly emarginate, the angles produced. Second and third joints of the labial palpi subequal, rather short.

Hab. Nyasaland, Mlanje (*S. A. Neave*), January to April; N.E. Rhodesia between Fort Jameson and Lundazi, 4000 ft. (*S. A. Neave*), June; Mashonaland, Salisbury (*G. A. K. Marshall*), January; British East Africa, Kibwezi, 3000 ft. (*S. A. Neave*), April.

This is a smaller species than *separabilis* or *hamiltoni*, and may also be distinguished in the male sex by the seventh tergite which is rounded, not truncate, and by the more narrowly emarginate eighth sternite. The female may be distinguished from *separabilis* by the much more pointed pygidial area. The galea is also much shorter and broader than in either of the above-mentioned species, being no longer than the scape.

38. *Tachytes tomentosa*, Kohl.

Tachytes tomentosus, Kohl, Ann. Soc. Ent. Belg. xxxv. p. 16 (1891).

♀.

♀. Nigra; clypeo, fronte, pronoto, pleuris, mesonoto lateribus, scutello apice, segmento mediano lateribus, segmentis dorsalibus 4 basalibus pygidioque aureo-pubescentibus; segmentis abdominalibus margine apicali brunneo-ferrugineis; tegulis testaceis; femoribus parte apicali, tibiis tarsisque ferrugineis; alis pallide flavo-hyalinis, venis ferrugineis.

♂. *Feminae similis.*

Long., ♀ 13-14 mm., ♂ 13 mm.

♀. Clypeus broadly rounded at the apex; vertex not distinctly punctured. Eyes separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum. Basal joint of the fore tarsus with five spines. Second sternite subopaque, very minutely and closely punctured, with a smooth area on the middle of the apical margin. In addition to the apical fasciæ the dorsal segments are thinly clothed with very short dull golden pubescence; the pygidial area is rounded at the apex. Third cubital cell shorter than the second on the cubitus by about one-quarter.

♂. Seventh tergite rather narrowly truncate at the apex; eighth ventral segment truncate at the apex, the angles not produced. The pubescence on the abdomen is paler than in the female; and the eyes are very close together on the vertex, separated by about the length of the first joint of the flagellum.

Hab. Cape (Kohl); Gold Coast, Northern Territories, Yapi (J. J. Simpson), December; Nyasaland, S.W. of Lake Chilwa (S. A. Neave), January; Uganda Protectorate, between S.E. shore of Lake Kioga and Kakinu, 2500 ft. (S. A. Neave), August.

Kohl's description is very brief, but I think I have rightly identified the species. The male from Uganda differs in having the eighth sternite very feebly emarginate, not truncate as in the specimen of the male from Yapi; the female from Yapi does not differ appreciably from that from Nyasaland.

39. *Tachytes versatilis*, sp. n.

♀. Nigra; fronte clypeoque griseo-argenteo-pubescentibus; thorace segmentoque mediano dense fulvo-pubescentibus; segmentis dorsalibus 4 basalibus fascia interrupta argenteo-pubescente; area pygidiali rufo-fusco-setosa; tegulis testaceis; calcaribus fuscis; unguiculis pallide ferrugineis; tarsorum spinis albidis; alis subhyalinis, apice leviter et angustissime infumatis, venis ferrugineis; vertice crasse et dense punctato.

♂. Feminae similis, segmento dorsali septimo aureo-pubescente. Long., ♀ 16-18 mm., ♂ 14 mm.

♀. Clypeus very broadly rounded, the extreme apex narrowly depressed and subemarginate in the middle. Second joint of the labial palpi stout, distinctly longer than the third; galea not elongate, very broadly rounded at the apex. Eyes separated on the vertex by a distance equal to the length of the two basal joints of the flagellum; the vertex coarsely and closely punctured. Basal joint of fore tarsus with six spines. Median segment scarcely longer than the scutellum and postscutellum combined. Abdomen closely and distinctly punctured, more sparsely at the base of the tergites than at the apex; second sternite shining, evenly, but not very closely or minutely, punctured. Pygidial area subtriangular, rather broadly rounded at the apex. Third cubital cell extending on the cubitus further than the apex of the radial cell; second abscissa of the radius sometimes longer than the third, but in some specimens shorter.

♂. Eyes separated on the vertex by a distance slightly exceeding the length of the second joint of the flagellum; seventh tergite broad, rather broadly subtruncate at the apex; eighth sternite rather widely, but not very deeply emarginate, the angles rather strongly produced. Second ventral segment with larger and closer punctures than in the female. Basal joint of fore tarsus with five spines.

Hab. Nyasaland, Mlanje (*S. A. Neave*), December to February; Lingadzi, near Domira Bay, 1700 ft. (*W. A. Lamborn*), August; Uganda Protectorate, between Kumi and N.E. shore of Lake Kioga, 3400-3600 ft. (*S. A. Neave*), August.

This species is most easily distinguished by the coarse close puncturation of the vertex. Otherwise it is very near *hirsutus*, Sm., but in that species the sternites are finely and very closely punctured, in *versatilis* coarsely and more sparsely punctured.

40. *Tachytes hirsuta*, Sm.

Tachytes hirsutus, Sm. Cat. Hym. B.M. iv. p. 300 (1856). ♂.

♂. Niger; tarsi articulis 4 apicalibus brunneo-ferrugineis; tegulis testaceis; alis hyalinis, basi pallidissime flavidulis, venis ferrugineis; fronte clypeoque aureo-pubescentibus; thorace segmentoque mediano fulvo-hirsutis; segmentis dorsalibus 4 basalibus fascia apicali griseo-argenteo pubescente; segmento septimo dorsali sparse aureo-pubescente.

Long. 14 mm.

♂. Clypeus broadly subtruncate at the apex; vertex rather sparsely and shallowly punctured; eyes separated on the vertex by a distance scarcely exceeding the length of the second joint of the flagellum; galea shorter than the scape. Basal joint of the fore tarsus with five spines; spur of hind tibia a little shorter than the basal joint of the hind tarsus. Second sternite finely and closely punctured; seventh tergite broadly rounded at the apex; eighth sternite narrow, deeply and narrowly emarginate at the apex, the apical angles bluntly produced.

Hab. Natal (*Smith*); Mashonaland, Salisbury (*G. A. K. Marshall*), January; Nyasaland, Mlanje (*S. A. Neave*), December.

41. *Tachytes habilis*, sp. n.

♂. Niger; tarsi subtus, calcaribusque fusco-ferrugineis; tegulis testaceis; alis hyalinis, pallidissime flavidulis, venis fulvis; fronte clypeoque aureo-pubescentibus; thorace segmentoque mediano griseo-aureo-pubescentibus; segmentis dorsalibus 4 basalibus fascia apicali griseo-argenteo-pubescente.

Long. 15 mm.

♂. Clypeus broadly rounded at the apex; galea shorter than the scape; vertex minutely and closely punctured; eyes separated on the vertex by a distance about equal to

the combined length of the two basal joints of the flagellum. Basal joint of fore tarsus with eight spines. Median segment at least half as long again as the scutellum, without a longitudinal sulcus on the dorsal surface. Sternites subopaque, very closely and finely punctured, with long sparse pubescence. Seventh tergite very broadly rounded at the apex, clothed with silver pubescence, slightly tinged with gold. Eighth sternite broadly rounded or subtruncate at the apex, the angles not produced.

Hab. Nyasaland, S.E. shore of Lake Nyasa, between Fort Maguire and Fort Johnston (*S. A. Neave*), March.

42. *Tachytes inexorabilis*, sp. n.

♀. Niger; fronte clypeoque argenteo-pilosis; thorace segmentoque mediano cinereo-pilosis; segmentis dorsalibus 4 basalibus fascia apicali argenteo-pubescentibus; tarsis fusco-ferrugineis; calcariibus pallide ferrugineis; tegulis testaceis; alis hyalinis, basi pallidissime flavo-tinctis, venis ferrugineis; area pygidiali rufo-fusco-setosa.

♂. Feminae similis; segmento septimo dorsali subargenteo-pubescente.

Long., ♀ 14 mm., ♂ 12-14 mm.

♀. Clypeus broadly rounded at the apex; vertex finely and closely punctured, with a few larger punctures; eyes separated on the vertex by a distance equal to the length of the second joint of the flagellum plus half of the third joint. Galea rather short, broadly rounded at the apex. Scutellum distinctly punctured; the median segment more than half as long again as the scutellum. Second sternite subopaque, very minutely and closely punctured; pygidial area broadly triangular, subacute at the apex. Third cubital cell extending very little further than the radial cell; the distance between the recurrent nervures on the cubitus greater than usual, fully equal to the third abscissa of the radius. Basal joint of the fore tarsus with six spines.

♂. Seventh tergite broadly rounded at the apex; eighth sternite rather shallowly emarginate, the teeth of the apical angles blunt. Eyes separated on the vertex by a distance about equal to the length of the two basal joints of the flagellum.

Hab. Transvaal, Johannesburg (*A. J. Chalmley*); Natal, Howick (*J. P. Cregoe*).

Very near *transvaalensis*, Cam., but the pygidial area is much more broadly triangular and the pubescence on it coarser. The condition of Cameron's type, however, is so

bad that the species is hardly to be recognized. The puncturation on the vertex is also finer and closer in *transvaalensis*.

This species also ranges northwards in East Africa, occurring in Uganda, Entebbe (*C. G. Gowdey*), August to February; British East Africa, Upper Kuja Valley, S. Kavirondo (*S. A. Neave*), May; Ilala, Maramas district, 4500 ft. (*S. A. Neave*), June.

43. *Tachytes transvaalensis*, Cam.

Tachytes transvaalensis, Cam. Entomologist, p. 153 (1905). ♀.

Differs from *inexorabilis* as noticed above, and also in the more shining and very sparsely punctured third and fourth ventral segments.

Hab. Transvaal.

44. *Tachytes erynnis*, sp. n.

♀. Nigra; tegulis testaceis, tarsis calcaribusque ferrugineis; alis basi flavo-hyalinis, apice subhyalinis, venis ferrugineis; fronte clypeoque argenteo-pubescentibus; thorace segmentoque mediano griseo-aureo-pubescentibus; segmentis dorsalibus 4 basalibus fascia apicali griseo-argenteo-pubescente; area pygidiali aureo-pubescente.

♀. *Feminæ similis*.

Long., ♀ 15 mm., ♂ 14 mm.

♀. Clypeus very broadly rounded at the apex, closely punctured, the anterior margin somewhat deflexed; vertex sparsely, but distinctly, punctured; eyes separated on the vertex by a distance about equal to the combined length of the two basal joints of the flagellum. Basal joint of the fore tarsus with six spines; spur of hind tibia not quite as long as the basal joint of the hind tarsus. Scutellum closely, but distinctly punctured; median segment about half as long again as the scutellum, the median sulcus indistinct on the dorsal surface. Second and third sternites minutely and closely punctured, the fourth smooth at the base, minutely and closely punctured on the apical half, the fifth with the fine punctures confined to the apex. Pygidial area triangular, very narrowly rounded at the apex. Wings short, not reaching to the apex of the abdomen.

♂. Eyes separated on the vertex by a distance scarcely exceeding half the length of the second joint of the flagellum; sternites closely and evenly, but not very minutely punctured; seventh tergite rather narrowly rounded at the apex; eighth sternite narrow, deeply emarginate.

Hab. Transvaal, Pretoria (*W. L. Distant*) ; Sterkfontein (*H. P. Thomasset*) ; Mashonaland, Salisbury (*G. A. K. Marshall*), January ; Natal, Estcourt ; Zululand, Mfongosi.

This may be distinguished from *inexorabilis* and *transvaalensis* by the greater approximation of the eyes on the vertex, especially in the male ; and by the yellower colour of the wings.

45. *Tachytes pulchricornis*, sp. n.

♂. Niger ; fronte clypeoque pallide aureo-pubescentibus ; pronoto, mesonoto lateribus, postscutelloque subargenteo-pubescentibus, pleuris segmentoquo mediano sparse albido-pilosis ; segmentis dorsalibus 4 basalibus fascia apicali griseo-argenteo-pubescente ; segmento dorsali septimo argenteo-pubescente ; flagello articulis 4-9 subtus brunneo-ochraceis ; tarsis brunneo-ferrugineis ; alis hyalinis, pallidissime flavidulis, nervis testaceis ; tegulis testaceis.
♀. Mari simillima ; flagello omnino nigro ; fronte clypeoque argenteo-pubescentibus ; area pygidiali rufo-aureo pubescente.
Long., ♂ ♀, 12-13 mm.

♂. Clypeus very broadly subtruncate at the apex ; vertex not distinctly punctured ; eyes separated on the vertex by a distance equal to the combined length of the two basal joints of the flagellum. Galea short, very broadly rounded at the apex ; second and third joints of the labial palpi short, subequal. Median segment about half as long again as the scutellum, the longitudinal sulcus almost obsolete. Seventh tergite rather broadly subtruncate at the apex ; the eighth sternite rather broadly emarginate, the apical angles strongly produced. Third cubital cell long, extending much beyond the apex of the radial cell, at least three-quarters of the length of the second on the cubitus. A variety has the abdominal fasciæ dull golden.

♀. Distance between the eyes on the vertex as in the male : pygidial area triangular, acute at the apex ; second sternite subopaque, closely microscopically punctured ; basal joint of fore tarsus with five spines. A variety has the abdominal fasciæ dull golden.

Hab. Nyasaland, Mlanje (*S. A. Neave*), March.

Subspecies *kolaensis*, subsp. n.

♂. Differs from the typical form in having the third to ninth joints of the flagellum ochraceous brown above as well as below, leaving only a black ring at the joints.

♀. The pygidial area very distinctly broader than in the typical form, broadly rounded at the apex.

Hab. Portuguese E. Africa, Valley of Kola River, near E. Mt. Chiperone, 1500–2000 ft. (*S. A. Neave*), April.

46. *Tachytes disputabilis*, sp. n.

♂. Niger; tarsi articulis 4 apicalibus ferrugineis, posticis supra infuscatis; tegulis testaceis; alis hyalinis; venis ferrugineis, apice fuscis; fronte clypeoque aureo-pubescentibus; thorace segmentoque mediano sparse aureo-griseo-pubescentibus; segmentis dorsalibus 4 basalibus fascia apicali griseo-argenteo-pubescente: segmento dorsali septimo argenteo pubescente; galea lata, scapo brevior.

Long., ♂, 11 mm.

♂. Clypeus broadly truncate at the apex; vertex not distinctly punctured, opaque; eyes separated on the vertex by a distance about equal to the combined length of the first and second joints of the flagellum. Thorax microscopically punctured; median segment nearly twice as long as the scutellum. Second sternite closely and minutely punctured; seventh tergite broadly rounded at the apex; eighth sternite emarginate, the apical angles produced. Basal joint of fore tarsus with four spines; spur of hind tibiae shorter than the basal joint of the hind tarsus. Third cubital cell nearly as long on the cubitus as the second, extending on the cubitus beyond the apex of the radial cell.

Hab. Nyasaland, S.W. of Lake Chilwa (*S. A. Neave*), January.

This is near *pulchricornis*, from which it differs in the colour of the antennae and in the much narrower seventh tergite and eighth sternite.

47. *Tachytes instabilis*, sp. n.

Very similar to *T. inexorabilis* in both sexes, but the pubescence on the thorax and median segment is golden grey, very short and close lying under sparse, long, erect hairs; the male has the seventh tergite broadly subtruncate at the apex, not rounded, and the eighth sternite much broader, though also emarginate; the punctures of the sternites are distinctly larger. The female differs in the sparse and large punctures of the third, fourth, and fifth sternites, which are shining, whereas in *inexorabilis*, except at the extreme base, they are opaque and very minutely and closely punctured; the eyes are a little nearer together on the vertex, being separated by a distance equal to the length of the two basal joints of the flagellum; the wings in both

sexes are slightly more yellowish at the base, and the galea is distinctly shorter and broader, being scarcely more than half as long as the scape, whereas in *inexorabilis* it is nearly as long as the scape.

Length, ♂ 11 mm., ♀ 12-14 mm.

* *Hab.* Nyasaland, Mlanje (*S. A. Neave*), January and February.

There are only five spines on the basal joint of the fore tarsus, in which character it agrees with *T. disputabilis*, but the apical segments of the male are much broader than in that species. The male has only four spines on the basal joint of the fore tarsus.

48. *Tachytes lachesis*, sp. n.

♀. Nigra; tibiis anticis basi extremo, calcaribus, tarsisque articulis apicalibus fusco-ferrugineis; alis hyalinis, pallidissime flavidulis, venis ferrugineis; fronte clypeoque aureo-pubescentibus; thorace segmentoque mediano griseo-aureo-pubescentibus; segmentis dorsalibus 4 basalibus fascia apicali subargenteo-pubescente; area pygidiali fusco-ferrugineo-pubescente.

Long. 13 mm.

♀. Clypeus very broadly rounded at the apex; galea much shorter than the scape; vertex microscopically punctured in the middle, with a few larger punctures near the eyes, which are separated on the vertex by a distance equal to the combined length of the two basal joints of the flagellum. Basal joint of the fore tarsi with six spines; spur of the hind tibia longer than the basal joint of the hind tarsus. Median segment scarcely longer in the middle than the scutellum, with a shallow, but distinct longitudinal sulcus. Sternites 3-5 shining, with large sparse punctures, smooth at the base. Pygidial area broadly rounded at the apex.

Hab. Nyasaland, Mlanje (*S. A. Neave*), February.

49. *Tachytes megæra*, sp. n.

♀. Nigra; tarsis subtus, articuloque apicali supra, calcaribusque ferrugineis; tegulis testaceis; alis basi flavidulis, apice hyalinis, venis ferrugineis; fronte clypeoque argenteo-pubescentibus; thorace segmentoque mediano albido-pubescentibus; segmentis dorsalibus 4 basalibus fascia apicali griseo-argenteo-pubescente; area pygidiali fusco-ferrugineo-setosa.

Long. 13 mm.

♀. Clypeus broadly subtruncate at the apex, the apical

margin deflexed; vertex very closely microscopically punctured; eyes separated on the vertex by a distance about equal to the length of the second joint of the flagellum. Galea shorter than the scape. Basal joint of the fore tarsus with five spines; spur of the hind tibia as long as the basal joint of the hind tarsus. Thorax closely and minutely punctured; second sternite and the third, fourth, and fifth sternites on the apical margin closely and minutely punctured; the three latter shining at the base, with large scattered punctures. Pygidial area triangular, rather narrowly rounded at the apex.

Hab. Gold Coast, Northern Territories, Yapi (*J. J. Simpson*), December.

50. *Tachytes notabilis*, sp. n.

♀. Nigra, gracilis, rugosula, sparse cinereo-pilosa; fronte clypeoque aureo-pubescentibus; segmentis dorsalibus 4 basalibus fascia apicali griseo-argentea; tegulis testaceis; calcaribus, unguiculis, tarsisque articulis apicalibus subtus ferrugineis; alis subhyalinis, venis testaceis; area pygidiali aureo-pubescente.

♂. *Feminæ similis.*

Long., ♀ 11–13 mm., ♂ 11 mm.

♀. Clypeus very broadly truncate at the apex; vertex closely and very finely punctured, with large sparse punctures intermingled; eyes separated on the vertex by a distance about equal to the length of the two basal joints of the flagellum. Thorax very finely rugulose; median segment more strongly rugulose, nearly twice as long as the scutellum. Basal joint of the fore tarsus with five spines; spur of the hind tibia as long as the basal joint of the hind tarsus. Second sternite minutely and closely punctured; pygidial area triangular, somewhat elongate, rather narrowly rounded at the apex. Galea shorter than the scape. Third abscissa of the radius shorter than the second; third cubital cell narrow, extending on the cubitus further than the apex of the radial cell.

♂. Eyes as far apart on the vertex as in the female; seventh tergite broadly rounded at the apex, rather sparsely clothed with very pale golden pubescence; eighth sternite semicircularly emarginate at the apex.

Hab. Nyasaland, Mlanje (*S. A. Neave*), January to June; Uganda, Entebbe (*C. G. Gowdey*), September; British East Africa, Tiwa River, Ukamba (*S. W. J. Scholefield*), January.

The Uganda and East African specimens have the pygidial

area more broadly rounded at the apex, but do not seem to differ otherwise. I have seen no males from these localities. The species is easily distinguished by the slender form and the sculpture of the thorax and median segment.

51. *Tachytes silverlocki*, sp. n.

♀. Nigra; fronte, clypeo pronotoque argenteo-pubescentibus; mesonoto lateribus, segmentisque dorsalibus 4 basilibus fascia apicali griseo-argenteo-pubescentibus; segmento mediano lateribus pleurisique albo-pilosis; tarsi articulis duobus apicalibus, articulis secundo tertioque basi, calcaribusque ferrugineis; pygidio aureo-pubescente; alis hyalinis, venis fuscis.

Long. 9-10 mm.

♀. Clypeus very broadly rounded at the apex, the margin narrowly depressed; vertex without distinct punctures. Eyes separated on the vertex by a distance fully equal to the combined length of the two basal joints of the flagellum. Median segment more than half as long again as the scutellum, without a median sulcus on the dorsal surface, except at the extreme apex. Pygidial area subtriangular, very narrowly rounded at the apex; second sternite subopaque, closely microscopically punctured. Basal joint of the fore tarsus with five whitish spines. Third abscissa of the radius a little longer than the second, the latter a little longer than the space between the recurrent nervures on the cubitus. Third cubital cell long and narrow, reaching on the cubitus much further than the apex of the radial cell.

Hab. N. Rhodesia, Pakasa (*O. Silverlock*), January; British E. Africa, Kisumu (*S. A. Neave*), April.

This little species is very near the Egyptian *T. cameruniana*, Morice, of which only the male is known; but as the colour of the tarsi and nervures as well as the details of neururation differ, I do not think that it is the female of that species.

*52. *Tachytes nigroannulata*, Bisch.

Tachytes nigroannulatus, Bisch. Arch. f. Naturges. A. 3, p. 69 (1913). ♂.

Hab. S. Rhodesia, Springvale; December.

This seems to be allied to *T. silverlocki*, but I do not think it can be the male of that species.

Liris diabolica, Sm.

Larrada diabolica, Sm. Ann. & Mag. Nat. Hist. (4) xii. p. 294 (1873). ♀.

Larra (Liris) opipara, Kohl, Ann. naturh. Hofmus. Wien, ix. p. 297 (1894). ♀.

Tachytes capitalis, Rad. Journ. acad. sc. & math. Lisboa, viii. p. 210 (1881). ♀.

Radoszkowski's description undoubtedly refers to this wide-ranging Ethiopian species.

Tachysphex agilis, Sm.

Tachytes agilis, Sm. Cat. Hym. B.M. iv. p. 301 (1856). ♂.

This is undoubtedly a *Tachysphex*.

These two species are included in *Tachytes* in Dalla Torre's Catalogue, but do not belong to the genus, Radoszkowski's name falling as a synonym and Smith's species *agilis* being a *Tachysphex*. *Tachytes etrusca*, Rossi, recorded by Radoszkowski from Angola, is doubtless an error in identification.

Notogonia trivittata, Kirby.

Tachytes trivittatus, W. F. Kirby, Bull. Liverp. Mus. iii. p. 16 (1900).

♂ ♀.

Notogonia expedita, Kohl, Hymenopteren Südarabiens, p. 51 (1906).

♂ ♀.

Kirby placed this species in the wrong genus. It inhabits Sokotra, and I have not seen specimens from continental Africa.

Tachysphex quadricolor, Gerst.

Lyrops quadricolor, Gerst. Monatsber. Akad. Wiss. Berlin, p. 510 (1857). ♀.

Lyrops quadricolor, Gerst. Peters. Reise n. Mossambique Zool. v. p. 477 (1862). ♀. T. 30. F. 13.

Tachytes quadricolor, D. T. Cat. Hymen. viii. p. 693 (1897).

I consider that this E. African species is undoubtedly a *Tachysphex*.

II.—*The Groups of the small and medium-sized South-American Felidæ.* By R. I. Pocock, F.R.S.

Writing in 1903 upon the spotted tiger-cats, excluding ocelots, of South America, Oldfield Thomas* pointed out that the species fall, or appear to fall, into the following groups:—

- I. Size larger. Fur soft and thick. Nape-hairs generally reversed forwards—at least, in part. Skull broadly rounded, with a large

* Ann. & Mag. Nat. Hist. (7) xii. pp. 234-239.

smooth brain-case and short face.—Including the Mexican and Central-American tiger-cats, *F. glauca*, Thos., *wiedii*, Schinz., and others.

- II. Size rather smaller. Fur harsher. Nape-hairs not reversed. Ground-colour darker. Skull long and narrow, somewhat resembling that of the jaguarondi, with narrow brain-case and elongated face.—*F. guttula*, Hensel.
- III. Size smallest. Fur medium or harsh. Nape-hairs not reversed. Skull small and delicate, with smooth brain-case and short face.—*F. pardinoides*, Gray (*F. guigna*, Hensel, nec Molina).
- IV. Group containing *F. geoffroyi*, d'Orb., and *F. salinarum*, Thos. (= *F. guigna*, Matsch., nec Mol.).
- V. Group containing a small bright-coloured cat with a delicate skull from Cayenne, and identified as *F. tigrina*, Schreber.

As Mr. Thomas remarks, doubt and confusion beset the determination and nomenclature of the species concerned, and the study of the group is beset with quite unusual difficulties owing to the variations in pattern and cranial characters exhibited by specimens obtained together and clearly belonging to the same species.

The main circumstance which appears to have prompted the publication of this paper by Thomas was the arrival at the British Museum of a collection of skins and skulls obtained by A. Robert at Roca Nova, in Parana.

Three of the skulls were sent to Berlin, and were compared by Dr. Matschie with the skulls of species from Rio Grande do Sul which had been named by Hensel. One of them was pronounced to be identical with the skull of the form identified by Hensel as *macroura* (= *wiedii*). It is, however, with the other two that I am now principally concerned. One of them—that of a male cat captured at an altitude of 930 to 1150 metres in Roca Nova, Parana—was declared by Matschie to be specifically inseparable from the skull of the form described by Hensel as *F. guttula*.

The second skull—that of a female with precisely the same particulars on its label—was referred by Matschie to the form identified by Hensel as *F. guigna*, Mol. But, as Thomas pointed out, this cat cannot, on the evidence, be considered as precisely identical with the species so named by Molina, because the latter came from Valdivia*, on the western side of the Andes. On the other hand, a comparison between the Parana skull, declared by Matschie to belong to *F. guigna*, Hensel (nec Molina), and the skull of the type of *F. pardinoides*, Gray, for which no locality was known, enabled Thomas to synonymize Hensel's species with Gray's. This was an important addition to our knowledge.

* Philippi, Arch. Naturg. xxxix. pt. 1, p. 8 (1873).

According to Matschie and Thomas, therefore, there are two species of cats living side by side in Roca Nova, Parana—a larger (*F. guttula*) and a smaller (*F. pardinoides*),—which differ in the skull-characters mentioned by Thomas in his diagnoses of groups II. and III.

As stated above, the two skulls which formed the basis of this opinion are those of a male and female respectively. An examination of them convinces me that the differences they present are beyond doubt individual and sexual, and not specific. Nor is this conviction shaken by a comparison between the skins of the two cats. That of the male shows a bold pattern of rather large blackish spots, strong stripes on the neck, and well-defined rings at the end of the tail. Although the female is black and clearly a melanistic sport, the pattern of rings on the tail and of large spots on the sides is perceptible and does not differ appreciably from that of the male. A second male from the same locality differs a little in skull-characters and somewhat markedly in pattern from the first, the spots being differentiated into incomplete black rings partly surrounding a brownish area.

Thus it appears that groups II. and III. of Thomas's classification are based upon a single species, *F. pardinoides*, Gray, with *guttula*, Hensel, and *guigna*, Hensel, as synonyms.

That *F. pardinoides* is closely related to *geoffroyi* does not appear to me to be open to question. *F. salinarum* also comes into this category. Moreover, as Thomas has pointed out, the skull of *F. pardinoides* shows many resemblances to that of *F. jaguarondi*, thus serving to link the latter with *F. geoffroyi*. Nevertheless, although *F. jaguarondi* is affiliated to the group of species, or subspecies, exemplified by *F. pardinoides*, *guigna*, *salinarum*, and *geoffroyi*, there is a wider interval between it and *pardinoides* than between the latter and *geoffroyi*.

Now, as regards group V.: this was established for the reception of a cat from Cayenne which Thomas identified as *F. tigrina*, Schreber. The skin of this animal is yellowish grey in the tint of the ground-colour and decidedly richer in tone than skins of *F. geoffroyi*, *salinarum*, and *pardinoides*. On each side of the body there are about five longitudinal rows of tolerably large, mostly imperfectly ocelliform spots. On the neck there are four rather narrow stripes, of which the two external pass forwards to the eyes, the median stopping short between the ears. The tail is long and boldly patterned to the end, and the hairs of the neck are not reversed.

Of the skull only the facial part is preserved. It is poorly developed from the muscular point of view, but the special

points to be noticed about it are:—(1) the postorbital processes of the frontal are short and spiniform; (2) the maxilla is antero-posteriorly expanded above and the plane of the anterior nares is nearly upright; (3) there is a distinct although small thickening on the malar by the preorbital foramen; (4) the lower carnassial has a long heel. This combination of cranial characters, coupled with the backward direction of the hairs on the neck, indicates, in my opinion, affiliation between this species and forms related to *F. pardinoides* and dissociates it from the group represented by *F. wiedii* (*macroura*). The interest of this view lies in the circumstance that *F. wiedii*, until the publication of Thomas's paper, was always regarded as specifically identical with *F. tigrina*, the latter name standing for the species. Since I can discover no valid reason for dissenting from Thomas's determination of this cat as *F. tigrina*, Schreb., but, on the contrary, much that is in its favour *, it will be expedient, I think, to adopt his proposal, and regard the specimen in the Museum as embodying the characters of *F. tigrina*, thus releasing *wiedii* from the synonymy of that species.

Thus groups II., III., IV., and V. of Thomas's arrangement may be fused into one, and the resulting assemblage may be amplified by the inclusion of *F. jaguarondi*, with its colour-mutation *eyra*, an unspotted species with which Thomas did not deal.

I have recently shown (Ann. & Mag. Nat. Hist. (8) xix. pp. 129–132, 1917) that *F. wiedii* differs from *F. geoffroyi*, *salinarum*, and *jaguarondi* in the structure of the feet, and that *F. pardalis* resembles *F. wiedii* in that particular. In *F. pardalis* also the hair of the nape is always reversed in direction, as is usually, at all events, the case in *F. wiedii*. As living animals these two species are often very difficult to distinguish except by size and the length of the tail. In my opinion they are too closely related to be placed in different groups, despite the differences in the skulls.

Finally, there are the two species, or subspecies, known as *F. colocolo* † and *F. pajeros*, which, as I have recently shown (Ann. & Mag. Nat. Hist. (8) xviii. p. 329, 1916), differ in the

* It is true that Buffon's figure of the margay, reproduced by Schreber, suggests a cat with rather a bolder pattern, a longer tail, and spots on the middle of the forehead; but it would, I think, be hypercritical to expect complete accuracy in an antique illustration.

† The cranial differences between these two forms described by Philippi do not exist. That author's example of *F. colocolo* appears to me to have been a menagerie-reared specimen, judging from the peculiar shape of the skull.

structure of the auditory bulla from all the other Felidæ of America. These cats have been affiliated with the Old-World forms *F. ocreata* and *sylvestris*, but their affinities appear to me to be clearly with their compatriots probably of the *F. geoffroyi* group.

To sum up: the American Felidæ, large, small, and medium-sized, may be relegated to the following groups:—

1. Group exemplified by *F. pardalis* and *F. wiedii*.
 2. Group exemplified by *F. guigna*, *F. pardinoides*, *F. salinarum*, *F. geoffroyi*, *F. tigrina*, and *F. jaguarondi*.
 3. Group exemplified by *F. colocolo* and *F. pajeros*.
 4. Group exemplified by *F. canadensis* and *F. rufus*.
 5. Group exemplified by *F. concolor*.
 6. Group exemplified by *Panthera onca*.
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III.—*The Geographical Races of Galago crassicaudatus.* By OLDFIELD THOMAS.

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IN his 'Primates' Dr. D. G. Elliot has recognized a number of species of the *Galago crassicaudatus* group, these species being arranged practically without regard to their geographical relationships; and an examination of our specimens would seem to show that some revision of the group is necessary.

In the first place, a study of the skulls indicates that the East-African forms—*hindei**, *panganiensis*, *lasiotis*, *badius*, *kikuyuensis*, and *agisymbanus*,—which Dr. Elliot has either sandwiched between or united with the forms from Nyasa and southwards, are really distinguishable from all the latter by their smaller skulls.

There is a good deal of variation in East Africa as regards skull-size, and there are probably several valid races there, but these I have not at present material to deal with.

On the other hand, the more southern skulls—Rhodesia to Zululand—are really very uniform in size and proportions, when the changes and variations due to age and sex are properly allowed for. The frequent references in Elliot to the proportions of the muzzle are really based on characters due to sex, the large broad-rooted canines of the male

* References to all the published names mentioned in the present paper are given in Elliot's 'Primates,' i. pp. 54-63, and are not now repeated.

causing the muzzle in that sex to be conspicuously more developed than in the female. This difference has been taken again and again for a racial character, but is really only a sexual one.

As to size, those from the north of the area—Rhodesia—average larger than the more southern ones, but the difference is not very great; while of other cranial characters there do not seem to be any at all, and the teeth are alike throughout.

Colour-characters are therefore the only means of sorting the races, and on this account I should consider all to belong to but a single species—*G. crassicaudatus*—with several local subspecies.

The type-locality of *crassicaudatus* itself, not known at the time of description, has first to be settled, and on this I should accept the first authoritative identification of specimens and statement of locality, which were made by Peters in 1852. He says that Geoffroy's type-specimen "stammt ohne Zweifel ebenfals aus Mossambique her," and identifies with it his own specimens from various places, of which Quelimane is the first to be mentioned. I should therefore take that as the type-locality.

As a consequence, Gray's *kirkii* from the same place becomes an absolute synonym of *crassicaudatus*, and his type-specimen is a topotype of it.

With regard to the next name on the list, *garnetti* of Ogilby, commonly assigned to "Natal," I find that the skull of the type—which is in the Museum, in spite of Elliot's assertion to the contrary—is distinctly too small for any S.-African *Galago* at all, while it exactly agrees with two from Zanzibar Island (coll. Sir J. Kirk and C. H. B. Grant), representing *G. agisymbanus*, Coquerel.

As the locality of the type was nowhere recorded, and was definitely stated in the MS. Catalogue of the Zoological Society's Museum to be "unknown," Zanzibar is as likely a locality as Natal, and I therefore propose to accept it for the *Galago* of that island. It would thus be the first of the E.-African series of names, and would antedate Coquerel's *agisymbanus*.

The following are the four subspecies of *crassicaudatus* which appear to me to be recognizable, taking them from north to south:—

1. *G. crassicaudatus monteiri*, Gray.

Wholly grey.

Angola (*Monteiro, Ansorge*), N. Rhodesia and Angoniland (*Neave, Melland, Mrs. Colville*).

The skull of the type-specimen is in the Museum (no. 5. 1. 20. 1).

2. *G. c. crassicaudatus*, Geoff.

Otogale crassicaudata, var. *kirki*, Gray.

Grey, but washed on crown and median dorsal area with buffy or drabby brown. Tail greyish, varying towards buffy or "cinnamon-buff"—the tip generally lighter. Lower part of limbs brown.

Zambesia—Blantyre and Chiradzula, Southern Nyasa (Sir H. Johnston), Quelimane (Peters, Kirk), Gorongosa Mts. (Rudd Exploration), Melsetter (Swynnerton).

3. *G. c. umbrosus*, subsp. n.

Darker than other races throughout. Smoky greyish brown (hair-brown) on body, a clearer grey patch behind and below ears; under surface smoky greyish, the slaty bases of the hairs more prominent than usual, and their tips duller and more drabby. Limbs brown, the wrists, upper side of fingers, hairy part of soles, and upper side of feet nearly or quite black. Tail dark greyish brown, its hairs dark at base, and its end blackish in the type, though not in the paratype.

Dimensions of type:—

Head and body 310 mm.; tail 390; hind foot 86; ear 62.

Skull: front of canine to back of m^3 27; premolar-molar series 22·3.

Northern Transvaal. Specimens from Tzaneen Estate, Zoutpansburg District. "Caught on Woodbush Mt., in Bush."

Type. Old female. B.M. no. 9. 3. 2. 2. Original number 193. Collected 14th July, 1907, by Dr. H. Lyster Jameson.

This is a darker and more smoky-coloured race than the others, such as might come from an area with a heavier rainfall. It is less grey than *crassicaudatus*, less brown than the next subspecies, while its dark limbs and blackish feet are peculiar to itself. In the general darkening it is probable also that a majority of individuals will prove to have blackish tail-tips, as in the type.

4. *G. c. zuluensis*, Elliot.

G. garnetti of authors referring to Natal and Zululand specimens.

Brown or buffy brown throughout above, buffy whitish below, the tips of the belly-hairs a clearer buffy than in *umbrosus*. Hands and feet more or less cinnamon-brown, only becoming blackish on the digits. Tail dull brownish, commonly darkening to black at tip.

Zululand (*Dahl, and Rudd Exploration*). Natal, *vide* W. L. Selater and others.

Readily distinguishable by its general brownish colour.

IV.—*New Heterocera from Dutch New Guinea*. By J. J. JOICEY, F.L.S., F.Z.S., F.E.S., and G. TALBOT, F.E.S.

[Plates I.–IV.]

THE species described in the present paper were collected by Messrs. A., C., and F. Pratt in the region of the Arfak and Wandammen Mountains in 1914.

The types are in the collection of Joicey.

Our thanks are due to Sir G. F. Hampson, of the British Museum, to Lord Rothschild, and to Mr. G. T. Bethune-Baker, for help kindly given in comparing specimens. Further, Mr. L. B. Prout has examined all the Geometridæ and given us the benefit of his unrivalled knowledge of this family.

Arctiidaæ.

Diacrisia ochrifrons, sp. n.

(Pl. I. fig. 2.)

Allied to *dinawa*, B. Bkr. *, but easily distinguished by the frons being black at the sides.

♀. *Upperside*.—*Fore wing* with pale ochraceous ground-colour with markings somewhat as in *dinawa*; the basal costal stripe extended below cell to inner margin, the suffusion being paler below 1 *b*; the discal band narrower than in *dinawa*, especially at the costa, the spot below vein 3 not joined to the one at the base of cellule 2. and spot below vein 1 *a* not touching inner margin; the upper part of post-discal band not running from apex as in *dinawa*, but from the costa, where it is 5 mm. broad, and curving outwards below vein 6 forms a large tooth-shaped patch; the

* *Diacrisia dinawa*, Bethune-Baker, Nov. Zool. xi. p. 413, pl. iv. fig. 25 (1904) (*Dinawa*, Brit. N. Guinea).

spot below this in cellule 4 not divided; three small spots before the apex; traces of dots in the distal area in 3 and 4. *Hind wing* with a black mark on upper discocellular, a black anal spot, two spots on either side of vein 2, two large ones on either side of vein 5, no apical spot.

Underside.—*Fore wing* with markings as above, reduced in basal and median areas; discal band with costal patch separated from patch at lower angle of cell. *Hind wing* with a small round spot at middle of costa, other markings as above.

Antennæ blackish brown; palpi and sides of frons blackish brown; central part of frons and vertex pale ochraceous; tegulae and patagia dark ochraceous; patagia with a blackish basal patch, represented in *dinawa* by a free rounded spot and a dot at extreme base; thorax with a blackish mesial line; abdomen crimson above, pale ochraceous below, a black dorsal stripe and lateral series of spots; legs and pectus blackish brown, fore coxae and femora crimson on outside; a crimson tuft at base of thorax.

Length of fore wing 27 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. 1 ♂.

Noctuidæ.

Subfamily ACRONYCTINÆ.

CORDYLEPALPA, nom. nov.

We substitute this name for *Clavipalpa*, J. & T., which is preoccupied (*Clavipalpa*, Joicey & Talbot, Trans. Ent. Soc. Lond. 1915 (June), p. 377).

Subfamily NOCTUINÆ.

Athyrra spilota, sp. n.

(Pl. I. fig. 3.)

♀. *Upperside*.—*Fore wing* with dark chestnut-brown ground-colour; a wavy black basal line, thickened on costa; an antemedian line, black, irregular, and curved outwardly, thickened on the costa and posteriorly broadened to a triangular patch; a lilac-grey quadrate costal patch, bearing a black dot near its lower outer angle, forming the upper part of an antemedian band; lower part of antemedian band much broader, dark green; a yellowish stripe on vein 2; three curved yellowish marks below the submedian; a dark greenish costal patch of spots beyond the cell, outwardly defined by a thin grey post-discal line; a

lilac subterminal band, shaded with dark grey; some dark grey shading on distal and extreme basal areas; sparse lilac-grey dusting over the wing. *Hind wing* fuscous-grey, some sparse white scaling on outer margin; fringe fuscous, dusted with white.

Underside fuscous grey. *Fore wing* with inner half of fringe white; an ochreous tinge on costa near apex. *Hind wing* finely dusted with white.

Antennæ reddish brown; palpi blackish brown; head fuscous mixed with grey-white; thorax and abdomen fuscous; femora and tibiæ fuscous, tarsi ochreous.

Length of fore wing 23 mm.

Hab. Angi Lakes, Arfak Mtns., 6000 feet, March.

2 ♀ ♀. A specimen in the B.M. from Mt. Goliath.

Subfamily FOCILLINÆ.

Mecodina polyscia, sp. n.

(Pl. I. fig. 5.)

Allied to *ekeikei*, B.-Bkr. *, but darker in colour, no white discocellular points and no serrated line within the pale post-discal band; subterminal black dots, which are absent in *ekeikei*.

♂. *Upperside*.—*Fore wing* fuscous brown, proximal two-thirds with a purplish tinge; an irregular fuscous basal line; a black dot in the cell; two waved discal lines, slightly outwardly curved from the costa, the space between them without purple tinge; inner edge of darker distal area defining a pale post-discal band; an irregular subterminal series of black dots between the veins; termen slightly purplish. *Hind wing* fuscous-brown.

Underside paler than above. *Hind wing* with a faint blackish discal band, and an indistinct subterminal line.

Antennæ ciliate, fuscous-brown; head, palpi, thorax, abdomen, and legs fuscous-brown.

Length of fore wing 20 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. 1 ♂. In B.M. a specimen from Fak-Fak, Dutch S.W. New Guinea.

We place this species provisionally in the genus *Mecodina*, but it differs from the type-form of that genus in vein 5 of the hind wing arising above the lower angle of cell. The antennæ are of moderate length with long cilia.

* *Ceromacra ekeikei*, Bethune-Baker, Nov. Zool. xiii. p. 284 (1906) (Brit. N. Guinea).

We must mention here that *ekeikei*, B.-Bkr., was placed by its author in the genus *Ceromacra*, Guen., together with other allied species. The type of this genus is from Surinam, and a comparison of this insect with *polyscia* shows that the New Guinea species do not belong to *Ceromacra*.

Zethes ochreomarginata, sp. n.
(Pl. I. fig. 4.)

Allied to *lilacea**, B.-Bkr., but differing in colour, and without a series of dark dots near the post-discal line.

♂. Upperside ochraceous brown with an oblique, double, and blackish post-discal line. Distal area beyond post-discal line, brownish ochraceous; proximal border of post-discal line suffused with black scaling; basal area brownish ochraceous. *Fore wing* with an irregular brown basal line; a reniform spot defined by pale ochreous; an oblique blackish line from lower inner edge of reniform to costa; a curved and outwardly-toothed blackish line from lower outer edge of reniform to costa; a marginal (not admarginal) series of black dots on the veins, the posterior two much larger than the others, on both wings.

Underside greyish ochraceous, much speckled with black; a blackish post-discal band on both wings.

Antennæ brown, bipectinate for four-fifths, the pectines minutely ciliate and ending in a fine bristle, terminal fifth ciliate. Palpi ochreous-brown, black at sides; head, thorax, legs, and abdomen ochreous-brown.

Length of fore wing 18 mm.

Hab. Wandammen Mtns., 3000–4000 feet. Nov. 1 ♂.

Subfamily DELTOIDINÆ.

Pseudaglossa bipupillata, sp. n.
(Pl. I. fig. 6.)

We place this provisionally in *Pseudaglossa*, of which it may constitute a new section. It differs from other forms of the genus in the antennæ of the ♂ being provided with bristles and cilia, whilst the palpi have a long third segment, also in the fore wing having a costal fold and fringe below.

♂. *Upperside*.—*Fore wing* smoky grey, darker in basal half; an irregular basal black line, thicker anteriorly; a

* *Zethes lilacea*, Bethune-Baker, Nov. Zool. xiii. p. 272 (1906) (Brit. N. Guinea).

strongly dentate black post-discal line; an irregular black subterminal line, nearly parallel to post-discal line and twice its thickness; a marginal series of black dots between the veins; orbicular small, fulvous, defined by black; reniform fulvous, defined by black and bearing two black pupils; a black suffusion between reniform and orbicular. *Hind wing* grey; a faint discocellular mark and an indistinct subterminal line.

Underside grey. *Fore wing* darker at apex; a costal fold, bearing a fringe of smoky-grey hair, extending from base to end of cell. *Hind wing* with darker suffusion at apex; a distinct discocellular mark; an indistinct and irregular post-discal line, and subterminal line, the latter angled in cellule 5 close to margin.

Antennæ black with simple bristles and cilia; palpi dark grey, paler on inside, third segment long; head dark grey; tegulae fulvous, patagia black; abdomen grey, anal tuft pale ochraceous; legs black, mixed with pale ochraceous, femora with a fringe of hair on inside, fore tibiae with tuft of hair at base on inside, mid and hind tibiae with a tuft of hair at base on outside.

Length of fore wing 19 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. (type), and Ninay Valley (1 ♂ in B.M.).

Hypena montana, sp. n.

(Pl. I. fig. 7.)

♂. *Upperside*.—*Fore wing* grey-black; an oblique black line from apex to inner margin, thickened posteriorly and proximally edged with ochreous, which is for the most part shaded over; a thin black irregular post-discal line merged posteriorly with the outer oblique line; some thin black lines in the distal area below the oblique line, and a thin black subterminal line; an ochreous dot on the discocellular. *Hind wing* with costa and outer marginal border sooty grey, narrowly so beyond vein 2; rest of wing white to base.

Underside.—*Fore wing* sooty grey, white at extreme base; costa, and to a less extent the outer margin, dusted with grey-white. *Hind wing* as above, but marginal area irrorated with white; a dark discocellular spot.

Antennæ sooty grey; palpi, head, and thorax black; abdomen sooty grey, laterally with first three segments white, and ventrally white at base; legs grey mixed with black.

Length of fore wing 15 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. 4 ♂♂.

Lymantriidæ.

Euproctis chlorospila, sp. n.

(Pl. I. fig. 8.)

Allied to *edwardsi* *, Newm., and *huntei* †, Warr.

♂. *Upperside*.—*Fore wing* brownish fuscous with costal area fuscous-grey. Outer margin broadly bright yellow, deeply indented by ground-colour in cellule 3; a marginal series of spots of ground-colour between the veins, each spot, excepting the one in 2, connected by a thin stripe to the proximal ground-colour; a bright yellow stripe on 1 c; an oblong white spot on the discocellular, edged with orange proximally and distally. *Hind wing* bright yellow.

Underside pale yellow.

Antennæ with comb pale rufous, shaft grey; head and thorax pale yellow; palpi grey-black; abdomen orange-yellow above, pale yellow below; pectus, legs, and anal tuft pale yellow.

Length of fore wing 24 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. 2 ♂ ♂.

Euproctis acrita, sp. n.

(Pl. I. fig. 10.)

Allied to *dersa* ‡, Moore, but differs in the yellow colour of the hind wings and absence of discoidal spot on fore wing.

♂. *Upperside* orange-yellow. *Fore wing* with veins whitish in distal area.

Underside as above. *Fore wing* with costa whitish.

The co-type is paler, especially on the underside.

Antennæ with comb grey-brown, shaft pale yellow; palpi black above, grey-white below; head and tegulæ pale yellow, patagia orange-yellow; abdomen above orange-yellow, terminal segments black, below pale yellow; anal tuft, pectus, and legs pale yellow.

Length of fore wing 17–19 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. 2 ♂ ♂.

* *Teara edwardsi*, Newm. Trans. Ent. Soc. Lond. 1856, p. 284, pl. xviii. figs. 9, 10 (Australia).

† *Euproctis huntei*, Warren, Nov. Zool. x. p. 120 (1903) (Brit. N. Guinea).

‡ *Euproctis dersa*, Moore, Cat. Lep. E. I. C. ii. p. 347 (1859) (Java).

Euproctis chlora, sp. n.

(Pl. I. fig. 11.)

♂. Upperside with pale fawn ground-colour. *Fore wing* with costa grey-white, veins broadly grey-white. *Hind wing* with a pale yellow suffusion not reaching outer margin and deeper on the inner margin.

Underside paler than upper, more cream-colour. *Hind wing* pale yellow on inner margin.

Antennæ with comb pale rufous, shaft white; head and thorax grey-white tinged with yellow; palpi grey-white, orange on inside; abdomen with dorsum too rubbed for description, sides yellow, mixed with grey-white, ventral surface grey-white; legs grey-white.

Length of fore wing 19 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, Jan.-Feb.
1 ♂.

Euproctis semirufa, sp. n.

(Pl. I. fig. 9.)

Allied to *mambara**, B.-Bkr., but has the fore wing more reddish and hind wing with black inner margin.

♂. *Upperside*.—*Fore wing* with purplish-brown ground-colour, median area reddish orange, an orange discocellular patch, outwardly diffuse. *Hind wing* pale orange, inner margin black.

Underside.—*Fore wing* orange; costa dark grey, outer margin purplish brown. *Hind wing* as above.

Antennæ, head, thorax, and basal segment of abdomen rufous; palpi rufous, black on inside; abdomen black, mesial ventral surface grey, anal tuft pale ochreous; pectus and legs pale ochreous.

Length of fore wing 20 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, Jan.-Feb.
1 ♂.

Also in Tring Museum from Ninay Valley, Nov.

Colussa odontogrammata, sp. n.

(Pl. III. fig. 14.)

Allied to *eceicei*, Bkr.†, but is smaller, with less defined markings and antennæ white.

* *Euproctis mambara*, Bethune-Baker, Nov. Zool. xv. p. 188 (1908) (Brit. N. Guinea).

† *Anthela ekeikei*, Bethune-Baker, Nov. Zool. xi. p. 403; l. c. p. 429, pl. vi. fig. 42, as *Collusa ekeikei* (1904) (Brit. N. Guinea).

♂. Upperside dark yellow, fore wing paler in basal part and on costa. *Fore wing* with markings as in *ecceice*; the post-discal line is filled in with black, but is faintly marked; the waved lines and series of black dots in the distal area are indistinct; the distal line is marked on the costa by a black streak, a heavier black costal spot on the post-discal line; another black costal spot at the end of the very indistinct discal line. *Hind wing* with markings as in *ecceice*, but less defined, the post-discal line as on fore wing, the series of black dots obsolete.

Underside dark yellow with only sparse blackish dusting. *Fore wing* with the two discal dots white; post-discal line black and sharply marked; an indistinct outer line marked by a black streak on costa; apico-costal edge whitish. *Hind wing* with markings as in *ecceice*, but less defined; lower area of outer margin washed with white.

Antennæ pale brown, shaft white; head black, vertex white; thorax pale ochraceous, abdomen darker; palpi and legs black, clothed with grey-white hair.

Length of fore wing 25 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. One specimen.

Imaus nepha, sp. n.
(Pl. I. fig. 12.)

♂. Upperside snow-white. *Fore wing* finely dotted with grey-brown, and crossed by indistinct grey-brown lines. Basal and subbasal irregular lines; a discal dentate line; a post-discal crenulate line, directed inwards and approximating to discal line below vein 3; a subterminal irregular line; a series of black marginal dots between the veins; from 5 to 7 small dark spots on costa; a dark dot at origin of veins 4 and 5; a small round white spot in cell. *Hind wing* snow-white.

Underside snow-white, without markings.

Antennæ with comb pale rufous, shaft white; head, thorax, and abdomen white; palpi white, black at sides; pectus and legs white.

Length of fore wing 21 mm.

Hab. British and Dutch New Guinea.—Wandammen Mtns., 3000–4000 feet, Nov. (type), 10 ♂♂; Ninay Valley, Arfak Mtns., 3500 feet, Nov.–Jan., 1 ♂; Oetakwa River to 3500 feet, Oct.–Dec., 1 ♂; Biagi, Mambare River, 5000 feet, Brit. N. Guinea, Jan.–April, 2 ♂♂. Also in Tring Museum from Oetakwa River and Mt. Goliath.

Near *ganara**, Moore, from Java and Borneo, but markings more distinct and fore wing thickly dotted.

Imaus basistriga, sp. n.
(Pl. I. fig. 13.)

Allied to *nepha*, J. & T.

♂. *Upperside*.—*Fore wing* snow-white finely dotted with dark brown and with dark brown markings. A zig-zag basal line, heavily marked below the cell; lower edge of cell from base to a fourth of vein 5 outlined with dark brown; a faint waved antemedian line; discal and post-discal lines very indistinct; former defined anteriorly; a faint strongly dentate subterminal line; black marginal dots between the veins; discocellulars streaked with dark brown; four dark costal dots before the apex; a rounded white spot in cell. *Hind wing* greyish fuscous, a white area beyond cell.

Underside greyish fuscous. *Fore wing* white below the cell. *Hind wing* as above. *Cilia* white.

Antennae with comb rufous, shaft white; head and thorax white; palpi white, black at sides; pectus and legs white; abdomen grey; anal tuft white.

Length of fore wing 12 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. 1 ♂.

Dasychiroides obsoleta †, B.-Bkr. ♀.
(Pl. I. fig. 14.)

This species is distinguished from other forms in the genus by the intraneural marginal dots on the fore wing.

♀. Differs from the ♂ in the basal half of fore wing, except extreme base, being suffused with black.

Length of fore wing 28 mm.

Hab. British and Dutch New Guinea.

In Coll. Joicey from Biagi, Mambare R., Brit. New Guinea, 5000 feet, Jan. (2 ♂ ♂); Oetakwa River, S. Dutch New Guinea, Oct.–Dec. (2 ♂ ♂); Fak-Fak, Dutch New Guinea, 1700 feet, Dec. (1 ♂); Wandammen Mtns., 3000–4000 feet, Nov. (1 ♂, 1 ♀). In Tring Museum from Ninay Valley, Arfak Mtns. (♂ ♀).

* *Lymantria ganara*, Moore, Cat. Lep. E. I. C. ii. p. 344 (1859) (Java).

† *Dasychiroides obsoleta*, Bethune-Baker, Nov. Zool. xi. p. 406, pl. vi. fig. 43, ♂ (1904) (Brit. N. Guinea).

Notodontidæ.

Stauropus chloriolus, sp. n.

(Pl. I. fig. 15.)

Near *dubiosus**, B.-Bkr., and *mixta*†, B.-Bkr., but distinguished from the former by the black markings and green sealing of the fore wing, and from the latter especially by the darker fore wing and increased green irroration. This and other New Guinea *Stauropus* constitute a section of the genus having the antennæ of ♀ pectinated, the comb being nearly as long as in the ♂. The hind wing with the discocellular oblique and not sharply angled.

♀. *Upperside*.—*Fore wing* with dark reddish-brown ground-colour, irrorated with bright green sealing, especially at base and at distal margin. A thick black basal line and an antemedian line nearly parallel to it; a faint and oblique discal line, not distinct above vein 3, and nearly touching ante-median line at inner margin; a green lunulate discocellular spot; a heavy, black, irregular post-discal line, angled at veins 5 and 4; a well-defined black subterminal line, its lower part below vein 2 formed by two separate lines, the lower more proximal than the upper, crossing cellules 2 and 1c. *Hind wing* rufous-brown; costal edge dark brown to the middle, followed by a streak and a quadrate apical patch, as in other members of the genus, of dark brown.

Underside rufous-brown, paler in the basal area.

Antennæ with comb black, shaft rufous-brown; palpi rufous-brown, mixed with green on inside; head and thorax grey-white, mixed with brown; abdomen, pectus, and legs rufous-brown.

Length of fore wing 25 mm.

Hab. Wandammen Mts., 3000–4000 feet, Nov. 2 ♀ ♀.

Stauropus leucocraspedus, sp. n.

(Pl. II. fig. 2.)

Allied to *mediobrunnea*, B.-Bkr.‡, but easily distinguished by the broad white distal margin of the fore wing.

♀. *Upperside*.—*Fore wing* with proximal two-thirds deep reddish brown with black markings. A baso-costal grey-white patch tinged with brown; a heavy, black, oblique

* *S. dubiosus*, Bethune-Baker, Nov. Zool. xi. p. 379 (1904) (Brit. N. Guinea).

† *S. mixta*, Bethune-Baker, Ann. & Mag. Nat. Hist. ser. 8, vol. xvii. p. 385 (1916) (Brit. N. Guinea).

‡ *Stauropus mediobrunnea*, Bethune-Baker, Ann. & Mag. Nat. Hist. ser. 8, vol. xvii. p. 384 (1916) (Brit. N. Guinea).

antemedian line; a broader, black, irregular discal line, fused with the antemedian line at inner margin and again with it near origin of vein 2; a heavy black post-discal line, angled at cellule 3, anteriorly with outer edge running to near apex, interspace between it and discal line below vein 2, suffused with black; a black costal dash behind post-discal line; distal margin white with a thin black wavy subterminal line; fringe brown with white dots at the veins. *Hind wing* white, dusted with brown; a brownish basal shade; a pale brown post-discal band, broadening anteriorly, and joined to the blackish quadrate apical patch; costa brown; fringe brown, mixed with white.

Underside rufous-brown. *Fore wing* whitish on inner margin. *Hind wing* whitish at base.

Antennæ rufous; palpi rufous, tipped with white; head and thorax rufous, mixed with grey-white; abdomen pale reddish brown above, ochreous below; legs reddish brown.

Length of fore wing 20 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, March. 1 ♀.

Stauropus melanogramma, sp. n.

(Pl. I. fig. 16.)

Allied to *dubiosus*, B.-Bkr.*, but without green scaling, and with a prominent black post-discal line.

♂. *Upperside*.—*Fore wing* greyish brown; two obscure and oblique basal lines; a well-defined irregular black post-discal line, angled outwards at vein 4 and thence somewhat crenulate to inner margin; an indistinct and waved brown subterminal line; a deep brown curved subapical costal patch or band, appearing somewhat as a smudge. *Hind wing* pale rufous with a deep brown apical patch.

Underside pale rufous; basal area ochraceous.

Antennæ rufous; palpi ochraceous, sides reddish brown; head and thorax grey-brown; abdomen brownish ochraceous; legs reddish brown.

Length of fore wing 23 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. 1 ♂.

Stauropus trisospylus, sp. n.

(Pl. II. fig. 1.)

Allied to *kebeæ*, B.-Bkr.†, but smaller, paler, and fore wing with green scaling.

* *Stauropus dubiosus*, Bethune-Baker, Nov. Zool. xi. p. 379, pl. vi. fig. 39 (1904) (Brit. N. Guinea).

† *Stauropus kebeæ*, Bethune-Baker, Nov. Zool. xi. p. 378, pl. v. fig. 52 (1904) (Brit. N. Guinea).

♂. *Upperside*.—*Fore wing* reddish brown, thickly irrorated with grey-white and sparsely so by pale green. A reddish-brown and deeply-curved basal line; a subbasal U-shaped line not touching lower submedian, and parallel to it an antemedian line; a forked discal line, its upper part formed by the discocellular, its lower part divergent from vein 3; a double post-discal line, angled in cellule 3, the outer line black and well defined; an irregular subterminal line; at end of cell a rounded white spot centred with brown, and white scaling above it on costa; a similar and smaller spot outside the end of cell, and a white spot above it on costa; a similar spot below the cell on the antemedian line; fringe dotted with white at the veins. *Hind wing* with basal two-thirds white, distal margin pale rufous; costa scaled with brown; a quadrate blackish apical patch.

Underside.—*Fore wing* reddish brown; inner margin white. *Hind wing* white, some brown dusting at apex.

Antennæ rufous; palpi dark reddish brown, tipped with white; head and thorax reddish brown, irrorated with white scaling; legs reddish brown marked with white; pectus dirty white; abdomen missing.

Length of fore wing 18 mm.

Hab. Arfak Mtns., Angi Lakes, Jan.—Feb. 1 ♂.

Gargetta melanosticta, sp. n.

(Pl. II. fig. 5.)

Distinguished from *punctatissima*, B.-Bkr.*, by the large and blackish stigma.

♂. *Upperside*.—*Fore wing* ochraceous, irrorated with blackish brown. A double waved basal line; a very indistinct double antemedian line, somewhat crenulate; a post-discal row of black dots between the nervures, the anterior two with two others placed next them, the third below, the fourth and fifth shifted inwards, the sixth, seventh, and eighth placed more proximal in an oblique line; distally of these an indistinct blackish-brown crenulate line; a subterminal series of eight distinct black dots; a marginal series of black dots triangularly shaped; an oblong and slightly rounded blackish-brown stigma edged with black; a triangular blackish costal shade from apex to post-discal line. *Hind wing* pale rufous, ochreous at the base.

Underside ochraceous, hind wing paler.

Antennæ ochraceous; palpi ochraceous, mixed with brown

* *Gargetta punctatissima*, Bethune-Baker, Ann. & Mag. Nat. Hist. ser. 8, vol. xvii. pp. 382–383 (1916) (Brit. N. Guinea).

on the outside; head and thorax reddish brown, mixed with ochraceous; abdomen and posterior legs ochraceous; fore and intermediate legs ochraceous marked with blackish brown.

Length of fore wing 24 mm.

Hab. Wandammen Mtns., 3000-4000 feet, Nov. 4 ♂♂.

Omichlis leucosticta, sp. n.

(Pl. II. fig. 4.)

Distinguished from other species of the genus by the white serrate post-discal band.

♂ ♀. *Upperside*.—*Fore wing* rufous-brown: three basal dots black, edged with white; below the cell six curved white marks, in two rows, with some scaling on their inner side; a narrow white post-discal band, its proximal part formed of rounded white spots between the veins, each with a black dot on its inner side, and its distal part being a serrate line which touches the spots, this line edged by black vein-dots on its outer side; a subterminal row of indistinct black dots with white scaling; some black dusting in the anterior area between post-discal band and the margin, and also between the post-discal band and the white median spots; a black double discocellular dot. *Hind wing* pale rufous-brown with a double white anal spot placed in some blackish scaling.

Underside pale rufous-brown, hind wing whitish.

Antennæ rufous; palpi, head, and thorax rufous mixed with white; abdomen above pale rufous, below ochraceous; legs ochraceous.

Length of fore wing, ♂ 20 mm., ♀ 22 mm.

Hab. Wandammen Mtns., 3000-4000 feet, Nov. 1 ♂, 1 ♀.

Omichlis plagiosa, sp. n.

(Pl. II. fig. 3.)

Allied to *transversa*, B.-Bkr.*, but distinguished by a longitudinal line from the base to the outer margin of fore wing.

♀. *Upperside*.—*Fore wing* cinnamon-brown with darker brown lines. A basal line, angled and indistinct; a median line, angled below the middle; a discal line, well defined, straight and oblique; a post-discal line, anteriorly slightly curved, posteriorly forming an S, in the lower angle of

* *Omichlis transversa*, Bethune-Baker, Nov. Zool. xv. p. 178 (1908) (Brit. N. Guinea).

which is placed a rounded black spot divided by a grey dash; a subterminal line, slightly crenulate; a mesial longitudinal line, thicker than the others, running from the base along lower edge of cell and vein 4 to outer margin; reniform small, bright ochreous. *Hind wing* pale cinnamon-brown.

Underside.—*Fore wing* rufous-brown, paler at base and inner margin. *Hind wing* ochreous, dusted with rufous; a thick brown post-discal line, strongly curved at nervure 5.

Antennæ and palpi rufous-brown; thorax cinnamon-brown; abdomen greyish ochreous, dusted below with rufous; legs cinnamon-brown, the posterior ones ochreous on the inside.

Length of fore wing 21 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, March. 1 ♀.

Lasioceros dentilinea, sp. n.

(Pl. II. fig. 6.)

The genus *Lasioceros* was described by Mr. Bethune-Baker in Nov. Zool. vol. xi. p. 380 (1904), from a single specimen from the Aroa River, British New Guinea.

As the species we now describe differs in certain particulars from Baker's diagnosis of the genus, we considered it necessary to examine the type in the Tring Museum. Mr. L. B. Prout has very kindly undertaken to do this, with the result that we have to amend the original diagnosis.

The eyes are glabrous. The antennæ have the lower surface evenly ciliated to the tip. The femora are somewhat hairy. The hind wing has vein 8 approximating to 7 and not anastomosing.

L. dentilinea diverges from the generic structure as seen in *aroa*, B.-B.; and will constitute a new section of the genus. As it is in secondary sexual characters that *dentilinea* differs from *aroa* we do not feel justified in giving this a separate generic distinction. The new section of *Lasioceros* will be constituted by the following structure seen in ♂ *dentilinea*.

The antennæ with upper surface smoothly scaled, lower surface without concavity, pilose or thickly ciliate, with longer hairs on the outside. Hind tibiæ bearing a thick comb of hair. Underside of wings with much hairy scaling.

♂. *Upperside.*—*Fore wing* greyish ochreous, paler in the cell, with an apico-costal white suffusion which is also present on the costa at a third from base; intervening space filled in by a somewhat quadrate blackish patch from costa to vein 3, but not well-marked below costa; a curved black mark on discocellular, and below it a rounded dark spot; a

subterminal white line, strongly dentate anteriorly, but becoming obsolete posteriorly; veins streaked with blackish behind this line, these streaks separated from a post-discal series of dark points on the veins by a series of white dots. *Hind wing* fuscous with a paler basal area.

Underside paler than above; fore wing with no markings except a blackish streak on costa.

Head and palpi ochreous mixed with brown; antennæ brown, the simple ciliation of inner side as in *aroa*, but having nothing corresponding to the black sexual comb of *aroa*; tegulæ blackish brown; patagia grey-brown; abdomen grey with black anal tuft; legs grey, mixed with black-brown.

Length of fore wing 20 mm.

Hab. Wandammen Mtns., 3000-4000 feet, 1 ♂ (type). Also in Tring Museum from Oetakwa River, Biagi, Kumusi River, Collingwood Bay, and Goodenough Island. In B.M. 2 ♂ ♂ from Fak-Fak, Dutch N. Guinea, 1700 feet, Dec., 1 ♂, Fak-Fak, Jan.-Feb.

L. aroa is represented in the Tring Museum by the type (*Aroa* River), and 2 ♂ ♂ from Rook Island and Goodenough Island.

The systematic position of *Lasioceros* is not easy to place. We retain it in the Notodontidæ, in which family it was placed by Baker. Our reasons for doing so are on account of the short third joint of palpus and the fore wing having vein 1 *a* running into 1 *b*. This latter character is found in most Notodontidæ, but is not typical of Hypsidæ, to which family the genus has been referred by Sir George Hampson. The palpi are not Hypsid in character, but the position of vein 5 of the fore wing and 8 of the hind wing would afford some justification for regarding it as a Hypsid. Taking the characters as a whole, we consider that the position of vein 5 of the fore wing is a divergence from the normal, just as occurs in several Geometridæ.

Since these considerations were penned, it has come to our notice that the importance of the position of vein 5 of the fore wing was doubted by an American worker as a result of his investigations into the structure of the basal abdominal organ.

William J. M. Forbes, in an article "On the Tympanum of certain Lepidoptera" ('Psyche,' xxiii. n. 6, pp. 183-192, Dec. 1916), finds a special type of the basal abdominal organ to be characteristic of the Noctuidæ and notes (p. 188) that "*Alypia* and the Notodontidæ show interesting variants of this type," which in his scheme on pp. 189-90 he gives as

"Type 3 (parapleural fovea): Notodontidæ, Noctuidæ, Agaristidæ." In his "Summary and Conclusions," he observes that "A study of the base of the abdomen . . . suggests: (1) The Notodontidæ are better placed near the Noctuidæ than near the Geometridæ and Bombycidæ," and on p. 189 he remarks, *a propos* of leaving "the Notodontidæ as a solitary trifold family in a mass of Quadrifidæ," that "possibly the importance of the position of M^2 (vein 5) in the fore wing is less than it has been considered. Already we give little weight to it in the hind wing and in certain Hydrimenid Geometridæ such as *Eudule*."

Eupterotidæ.

Nervicompressa bakeri, sp. n.

(Pl. III. fig. 15.)

Nearest to *Nervicompressa unistrigata*, Bethune-Baker, Nov. Zool. xi. p. 390 (1904) (Brit. New Guinea). Larger, wings more rounded, and discal line of fore wing placed nearer base.

♂. *Upperside*.—*Fore wing* yellowish brown, apex and outer margin purplish brown, but faintly suffused below vein 5; a heavy brown straight discal line from costa at its middle to middle of inner margin; basal area with greyish-white scaling. *Hind wing* pale rufous-brown; a thin dark discal line; a faint post-discal line and indications of a subterminal line.

Underside darker. *Fore wing* with discal line faintly showing through from above. *Hind wing* with markings defined; subterminal line crenulate and space between it and margin scaled with brownish.

Antennæ black; head and tegulæ rufous; patagia ochreous; abdomen, pectus, and legs rufous; tarsi black.

Length of fore wing 21 mm.

Hab. Wandammen Mts., 3000–4000 feet, Nov. 7 ♂♂.

Geometridæ.

Subfam. *ÆNOCHROMINÆ*.

Onycodes leptoctenopris, Prout, ♀.

(Pl. III. fig. 8.)

O. leptoctenopris, Prout, Nov. Zool. xx. p. 391 (1913) (Mt. Goliath).

♀. *Upperside* with pinkish-brown ground-colour. *Fore wing* with an indistinct basal line; a greyish discal band

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widening on costa; a double oblique post-discal line reddish brown, the inner one above vein 6 curved inwards to costa, the outer one reaching apex, both lines curved outward and inward below vein 2. A third post-discal line, bluish white and strongly dentate, thicker posteriorly and edged with blackish on inside below 3. *Hind wing* darker with paler basal area, and paler narrow marginal edge.

Underside yellowish brown sparsely scaled with black. *Fore wing* with oblique post-discal brown line; some greyish scaling at apex.

Antennæ yellow-brown. Head and thorax pinkish brown; abdomen and legs yellow-brown; pectus grey-white.

Length of fore wing 20 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, March. 1 ♀.

As the above specimen was identified by Mr. Prout as the ♀ of his species, we therefore make it the *Heautotype* (H.t.). For the use of this term see Schuchert & Buckman, Ann. & Mag. Nat. Hist. ser. 7, vol. xvi. p. 102 (1905).

Subfam. *HEMITHEINÆ*.

Hypodoxa pallida, sp. n.

(Pl. IV. fig. 1.)

Near *regina*, Prout, Nov. Zool. xxiii. p. 8 (1916) (Rook Isd.).

Paler than *regina* and without discal spot on hind wing below.

♂. Upperside greyish green. *Fore wing* with base brownish black to near origin of vein 2 and leaving a bar of ground-colour on the costa; outer edge of black area curved; a black discal dot; a black post-discal line becoming obsolete posteriorly; it is slightly waved and outwardly curved to vein 4, whence it bends inwardly and is more irregular to the inner margin; a chocolate-brown post-discal band, well marked from costa to vein 4 below which it is represented by some sparse scaling; a waved subterminal brown line becoming closer to the margin posteriorly; some brown scaling in the marginal interspace in cellules 5, 4, and 2; a blackish marginal line which is accentuated between the veins. *Hind wing* with brownish-black basal area to end of cell; cell-tuft and part of tuft below it pale green; a blackish thin post-discal line, irregularly waved and edged with whitish distally; interspace between post-discal line and basal area paler than rest of wing; an indistinct submarginal line formed of whitish dots between veins; outer margin narrowly edged with brown; a chocolate-brown stripe filling cellule 2 from base to margin.

Underside grey-white, basal area pale chrome-yellow; a broad bluish-black distal band on both wings with well-defined inner edge on the fore wing touching margin in 2 and 4 and leaving a subterminal row of white dots, on the hind wing with an irregular outer edge. *Fore wing* with a well-defined black discal spot.

Head pale green; tegulae dark green; patagia chocolate-brown mixed with black; abdomen stone-grey; dorsal tuft brown, a pale yellow lateral stripe on first 5 segments; legs and underside of body stone-grey; fore legs chocolate-brown on outside; palpi grey-white, first segment chocolate-brown.

Length of fore wing 18 mm.

Hab. Wandammen Mtns., 3000-4000 feet, Nov. 1 ♂.

Anisozyga veniplaga plena, subsp. n.
(Pl. IV. fig. 6.)

Anisogamia veniplaga, Warr. Nov. Zool. xiv. p. 130 (1907) (Biagi).

♂. Differs in having the apical patch on the fore wing entire, and in the patches on the inner margin and on the hind wing being larger.

Hab. Wandammen Mtns., 3000-4000 feet, Nov. 4 ♂ ♂.

Prasinocyma angiana, sp. n.
(Pl. IV. fig. 13.)

Probably nearest to *corolla**, Prout.

♀. Colour sea-green as in *bicolor*, Warren †. Basal line much more angulated, terminal dots much smaller (?), discal dot of fore wing accompanied by a reddish mark, abdomen with a dorsal line; the two latter points associate this form with the *corolla* group. Differs from *corolla*, Prout, in colour and shape, the costal margin being relatively less elongate.

Length of fore wing 18 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, March. 1 ♀.

Subfam. *LARENTIINÆ*.

Anapalta semiviridis, sp. n.
(Pl. III. fig. 4.)

♀. *Upperside*.—*Fore wing* with black ground-colour mixed with brown scaling and dark green markings. A thin basal

* *Prasinocyma corolla*, Prout, Nov. Zool. xx. p. 431 (1913) (South Dutch N. Guinea).

† *Chlorochroma bicolor*, Warr. Nov. Zool. xiv. p. 131 (1907) (Brit. N. Guinea).

line. An irregular double median line from costa to inner margin, crossing cell below vein 2, followed by another indistinct irregular double line crossing cell at vein 2; the median vein striped with green. Beyond cell, distal area green, lighter proximally, defined by an irregular dentate edge. Some thin dark scalloped lines are visible in the green area, also a dark narrow subterminal band from the tornus to vein 3, and becoming obsolescent beyond; some dark shading below apex shows up a short and strongly dentate green line. A yellowish-green costal dash and a stripe below it cuts off a black apical spot, and proximally of this is a black costal bar which does not extend to the proximal ground-colour. *Hind wing* rufous-brown with a black tuft of hair across end of cell.

Underside rufous-brown. *Fore wing* paler in lower median area and in outer marginal area.

Head, thorax, and abdomen grey-green, brownish ochreous below. Legs rufous-brown. Antennæ grey-brown.

Length of fore wing 22 mm.

Hab. Wandammen Mts., 3000-4000 feet, Nov. 2 ♀ ♀.

Crasilogia dispar fulvitincta, subsp. n.
(Pl. IV. fig. 11.)

C. dispar, Warr. Nov. Zool. x. p. 374 (1903) (Aroa River).

♀. The ground-colour is more tawny than yellowish. The first discal line is less strongly dentate and the band is narrower; the basal pale band is more constricted. On the hind wing below the dentate lines are thicker and closer together.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, Jan.-Feb., 1914. One specimen.

Sauris griseolauta arfakensis, sp. n.
(Pl. IV. fig. 9.)

S. griseolauta, Warr. Nov. Zool. xiii. p. 112 (1906) (Brit. N. Guinea).

♀. Differs from *griseolauta* in being smaller, greener, median band of fore wing narrowing posteriorly, and hind wing lighter in colour.

Length of fore wing 12 mm.

Hab. Angi Lakes, Arfak Mtns., 6000 feet, March. One specimen.

Sauris definita, sp. n.
(Pl. IV. fig. 15.)

Near *Remodes volcanica*, Butl. Ann. & Mag. Nat. Hist. ser. 5, vol. xx. p. 247 (1887) (Shortland Island). Differs

from this in the fore wing being rather less broad and more sharply marked.

♀. *Upperside*.—*Fore wing* yellowish green with black markings consisting of irregularly waved transverse lines; three thick basal lines separated by a thin greenish line from two discal lines; a discocellular spot; two heavy post-discal lines followed by two faint greenish lines placed close together; two greenish lines in distal area, marked irregularly with black especially in cellules 1 *b*, 1 *c*, 2, 4, 5, 7, and at costa; a crenulate subterminal line; a series of black marginal spots on the veins. *Hind wing* greyish white with a darker marginal area.

Underside greyish brown with a silky gloss; basal areas paler.

Antennæ missing; head, thorax, and abdomen yellowish green; legs ochreous; abdomen below ochreous.

Length of fore wing 20 mm.

Hab. Angi Lakes, Arfak Mtns., 6000 feet, March. One specimen.

Subfam. *GEOMETRINÆ*.

Plutodes connexa wandammenensis, subsp. n.

(Pl. IV. fig. 2.)

P. connexa, Warr. Nov. Zool. xiii. p. 137 (1906) (Brit. N. Guinea).

♂. Distinguished from the allied form in the more strongly developed silvery edgings, in the triangular-shaped yellow costal area, and the more oblong-shaped yellow inner marginal area on the fore wing, and in the reduced yellow discal area on the hind wing.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. 1 ♂.

Eurychoria albicosta, sp. n.

(Pl. III. fig. 9.)

Near *flavirupta*, Warr. Nov. Zool. x. p. 402 (1906) (Aroa), ♀.

Eurychoria flavirupta, Prout, l. c. xiii. p. 40 (1916) (Arfak), ♂.

♂. Differs especially from the allied species in having the costal edge of fore wing snow-white.

Upperside rufous-brown irrorated with darker brown. Both wings with a black discocellular dot and a post-discal row of white dots on the veins.

Underside ochreous speckled with blackish. *Fore wing* darker distally, with a faint median and post-median band. *Hind wing* with a faint post-median crenulate line, outer margin edged with purplish brown. Both wings with a black discocellular dot.

Antennæ yellowish brown, white at base; palpi, head, and thorax rufous-brown; abdomen grey-brown; legs, pectus, and abdomen below paler ochraceous.

Length of fore wing 18 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, March. 1 ♂.

Nadagara camura, sp. n.

(Pl. IV. fig. 14.)

♂. Upperside reddish brown strongly suffused with dark purplish brown. *Fore wing* with dark basal line indistinct; a dark discocellular dot; a dark brown post-discal line, its upper part directed distad from centre to vein 6, where it is strongly angled and oblique to inner margin, its lower part from vein 6 edged outwardly by an indistinct grey-white line which is traversed by a dark line; an indistinct sub-terminal grey-white wavy line interrupted between veins 4 and 6; some grey-white scaling at apex. *Hind wing* with dark brown median line; an indistinct and dark post-discal band, dentate on the veins, and within which is a strongly waved grey-white line; a pale and indistinct waved sub-marginal line.

Underside rufous-brown. *Fore wing* with a blackish discocellular mark; discal line and two post-discal lines indistinct. *Hind wing* a little paler.

Head, thorax, and abdomen above dark brown; palpi rufous; fore coxæ rufous; legs grey; abdomen below grey-brown.

Length of fore wing 20 mm.

Hab. Wandammen Mtns., 3000–1000 feet, Nov. 1 ♂.

Nadagarodes sabulosus, sp. n.

(Pl. IV. fig. 12.)

♀. Upperside ground-colour rufous-brown with grey-white markings dusted with blackish. Both wings with a grey-white proximal area extending beyond cell and traversed by a narrow median band of ground-colour. An irregular and interrupted band of grey-white; below apex a grey-white marginal patch invaded by ground-colour.

Underside.—Both wings rufous-brown, darker distally. An irregular dark brown median line; a post-discal double line strongly dentate, better defined on fore wing; outer line ill-defined on hind wing; an indistinct waved submarginal line; on fore wing in cellules 6–7 below apex a white marginal spot invaded by ground-colour in lower part. A black discocellular line on fore wing.

Antennæ, head, thorax, and abdomen grey-brown above, rufous-brown below; legs rufous-brown.

Length of fore wing 20 mm.

Hab. Wandammen Mtns., 3000-4000 feet, Nov. 1 ♀.

Gubaria albimedia novoguineensis, subsp. n.

(Pl. III. fig. 5.)

G. albimedia, Warr. Nov. Zool. iii. p. 409 (1896) (Java).

♀. The white bands are narrower. The *hind wing* bears a larger black post-discal patch between veins 3 and 5 and another behind 3, narrowing to the submedian; these patches are narrowly separated from the band by an ochre-yellow line.

Underside with basal yellow on both wings reduced.

Hab. Wandammen Mtns., 3000-4000 feet, Nov. 1 ♀.

Pseudomiza opaca, sp. n.

(Pl. IV. fig. 7.)

♀. Pale ochreous-brown with darker brown markings.

Upperside.—*Fore wing* with a thick median line crossing cell below vein 2; a discal dot; a narrow discal band slightly curved, obsolescent near costa; a well-defined oblique post-discal line not reaching costal edge; outer distal area dark brown leaving a marginal band of ground-colour below vein 4; a series of black marginal dots, one in each cellule. *Hind wing* with a broad and not well-defined discal band, within which is a dark post-discal line; outer discal area darker than the basal; marginal black dots, one in each cellule.

Underside paler than upperside. *Fore wing* with a short dark basal line; an indistinct discal line; a post-discal band narrowing below vein 5; marginal dots between the veins as above. Basal two-thirds of median area sealed with metallic bluish green visible in a side light. *Hind wing* with a dark discal spot, a faint post-discal curved line, marginal dots as above.

Antennæ pale brown; head and thorax dark ochreous-brown; abdomen grey-brown; legs grey-brown.

Length of fore wing 20 mm.

Hab. Arlak Mtns., Angi Lakes, 6000 feet, March. 1 ♀.

Polyacme punctilinea, sp. n.

(Pl. IV. fig. 4.)

♀. Upperside yellow-brown with a reddish tinge. *Fore*

wing with a nearly straight basal line formed of black dots ; an indistinct and but slightly curved median line ; a brown discal spot ; an indistinct and nearly straight post-discal line and almost parallel with it proximally a series of black points on the veins ; post-discal line crossed in cellule 2 by a faint grey line running from apex to inner margin below origin of vein 3 and accentuated by black vein points ; a grey-white subterminal line interrupted by the veins, obsolete anteriorly and posteriorly, and more defined in cellules 3-5, the spot in 3 being well marked ; discal marginal area darker than rest of wing. *Hind wing* with a well-defined black discal spot ; an indistinct and straight median line ; two post-discal rows of black vein dots, the outer formed along a faint grey waved line ; a distinct grey-white subterminal line angled at vein 5 ; discal area below this and faint post-discal line, darker than basal and marginal areas ; a marginal row of black dots between the veins. Fringes of both wings edged anteriorly with grey-white.

Underside paler than above with upperside markings more or less defined. Both wings with a darker brown and wide post-discal band, its inner edge ill-defined, the outer dentate ; outer marginal area grey-white with a marginal row of black dots between the veins.

Antennæ, head, thorax, and abdomen grey-brown, legs dusted with black.

Length of fore wing 19 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, March. 1 ♀.

Epitherapis ruptimacula, sp. n.

(Pl. III. fig. 10.)

♂. *Upperside*.—*Fore wing* pale ochreous sparsely dusted with black. A faint dark oblique line crossing cell near its end ; a black dot on discocellular at vein 5 ; a dark sub-apical line from costa to vein 6 thence curving downwards to below 5, its lower part accentuated by two black dots ; a thin post-discal line of pure ground-colour, narrowly edged posteriorly and proximally with black, and marked with a white spot above vein 6 ; this line runs from inner margin at nearly a third from tornus to the costa near apex, is inwardly curved to vein 6, and thence angled outwardly to costa ; lower part of post-discal line from vein 4 borders a large black patch which is interrupted by the veins and forms four spots in the interspace below 2. *Hind wing* pale ochreous, sparsely speckled with black in inner and median area ; some white suffusion in median area and on inner

margin ; a dark oblique discal line showing through from below, and joined to it at inner margin an outwardly curved line, which joins it again at middle of cell ; an irregular post-discal line, anteriorly obsolete, defined from vein 5 and crenulate to inner margin ; this line borders two rounded black spots in 2 and 3, and the trace of a larger spot below them, which is not filled in with black.

Underside yellow-ochreous, sparsely speckled with black. *Fore wing* paler in basal and median area, here without black dots. Markings as above, but here defined ; a dark discal line, slightly curved. *Hind wing* with markings as above, and a thin curved post-discal line which borders inner edge of black spots ; a black discocellular dot.

Antennæ black, shaft ochreous ; head and palpi ochreous-grey ; thorax and abdomen pale ochreous, latter with a brownish dorsal stripe ; legs pale ochreous marked with brownish.

Length of fore wing 22 mm.

Hab. Angi Lakes, Arfak Mtns., 6000 feet, Jan.-Feb. One specimen.

Hygrochroa purpurascens, sp. n.
(Pl. IV. fig. 3.)

♂. Upperside purplish brown irrorated with yellow-brown. *Fore wing* with a pale yellow-brown discal patch invaded by ground-colour, occupying outer two-thirds of cell and adjacent costal area, and proximally of discal line reaching below cell to submedian, its upper part divided by a narrow brown discal line which is slightly curved ; an indistinct black post-discal line outwardly curved from costa to vein 4 and then proximally oblique ; a small rounded yellow-white subapical spot and a larger and more oblong spot of similar colour below vein 2. *Hind wing* with a dark brown slightly curved basal line ; basal area irrorated with yellow-brown ; a post-discal row of 5 or 6 yellow-white spots ; proximally of these a row of black dots, one on each vein.

Underside paler than the upper, strongly dusted with blackish and much irrorated with yellow-white ; markings less distinct than above.

Head, antennæ, and palpi yellow-brown ; thorax rufous-brown ; legs, abdomen, and underside of thorax pale purplish brown.

Length of fore wing 18 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, March. 1 ♂.

Cleora flaccida constricta, subsp. n.

(Pl. IV. fig. 16.)

Aleis flaccida, Warren, Nov. Zool. x. p. 388 (1903) (Aroa).

♀. Differs from the allied form in the two discal lines of hind wing becoming much closer together below vein 3. Also on the underside there is no dark margin to the wings.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. 1 ♀.

Cleora scripta, sp. n.

(Pl. III. fig. 7.)

♀. *Upperside*.—Ground-colour grey-white dusted strongly with dark brown. *Fore wing* with a black basal line crossing cell below vein 2 where it is slightly angled. An irregularly curved black post-discal line which thickens posteriorly; it curves outward from costa to vein 5, then inward to 4, then outward to below 3, and thence inward and waved to inner margin. A marginal border slightly darker than the rest of the wing. *Hind wing* with a curved black post-discal line which is thickest below vein 6. A discocellular spot outlined with black. Marginal border slightly darker than the rest of the wing.

Underside stone-grey, the dark lines showing through from above.

Head, thorax, and abdomen grey-white; legs and underside tinged with brown.

Length of fore wing 23 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, Jan.–Feb. 1 ♀.

Cleora discipuncta, sp. n.

(Pl. IV. fig. 8.)

Nearest *hoplogaster*, Prout, Nov. Zool. xxiii. p. 51 (1916) (Cent. Dutch N. Guinea).

♂. *Upperside*.—*Fore wing* with yellow-brown ground-colour irrorated with black. Base black; a subbasal white line, sharply angled in the cell and edged with black distally; two black spots in the cell, the inner one diffuse, the outer rounded and well defined; a black patch in the median area reaching vein 3; an outwardly-curved post-discal white line bordered proximally by a band of black spots; a subterminal series of eight small white spots edged with black, the anterior five connected, one in cellule 3, one in 2, and one on the inner margin bordering an inner black spot; the third anterior spot diffused proximally, forming a streak

with a black patch below it; a marginal series of black spots between the veins; costa dusted with black points. *Hind wing* grey-white with a dark discocellular spot, a thin post-discal dark line, a marginal row of from 3-5 black dots, fringe pale brown.

Underside of *fore wing* paler with blackish markings as above. *Hind wing* dusted with blackish, a well-defined black discal spot, a faint post-discal line and marginal dots.

Antennæ yellowish brown, marked with black; head, abdomen, and legs pale yellowish brown; patagia black.

Length of fore wing 17 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, Jan.-March. 3 ♂ ♂.

Paralcis aurantifascia latimacula, subsp. n.

(Pl. IV. fig. 10.)

P. aurantifascia, Prout, Nov. Zool. xxiii. p. 67 (1916) (Mt. Goliath).

♂. The pale band on fore wing is much broader and leaves a narrower margin; the proximal edge of band is straight below vein 3 and directed more distad; the basal area limited by the basal line is filled in with grey-brown. Below, the fore wing has the orange band broader, leaving a smaller dark apical area.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, Jan.-Feb., 1914. One specimen.

Paralcis albistigma, sp. n.

(Pl. III. fig. 2.)

♀. *Upperside*.—*Fore wing* with pinkish-brown ground-colour, much irrorated with black. An irregular black basal line, edged with white on inside. A dark discal band, its inner edge nearly straight and crossing cell at vein 2, its outer edge slightly curved outwardly and crossing end of cell and origin of vein 3. Adjacent to this is a broad white band sparsely scaled with ground-colour, reaching from costa to inner margin; its upper part to vein 4 is twice as wide as lower part, and in cellule 3 it runs out to the margin and fills the cellule; there is a dark comma-shaped costal spot which runs out into a thin, irregular, and indistinct line traversing the band. A waved submarginal white line, sharply angled below vein 3. Marginal border pinkish brown, white at apex. *Hind wing* grey with a faint white irregular subterminal line which becomes obsolescent anteriorly.

Underside with grey ground-colour. *Fore wing* with a

subapical band of orange-yellow extending to inner margin, and widest in cellule 3. In the type-specimen it is reduced proximally, but in the co-type it slightly invades the cell and its edges are nearly straight: in cellule 3 on the margin a square white spot joins the band. In the co-type is a thin waved yellow subterminal line from the costa to the white spot. *Hind wing* without markings.

Head, thorax, antennæ, and abdomen grey above and below; palpi and legs blackish, marked with grey.

Length of fore wing 22 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, Jan.-March.
2 ♀ ♀.

Paralcis indistincta, sp. n.

(Pl. IV. fig. 5.)

♂. *Upperside*.—*Fore wing* with smoky-black ground-colour and grey-white markings; a faint dark basal line crossing cell at vein 2; an indistinct dark median line, thicker anteriorly, crossing cell at vein 3, where it is angled, the upper part being at right angles to costa: a better-defined and thin post-discal line, curved inwards from costa to vein 6, then outward to 5, and thence oblique to inner margin; the spaces between these lines more or less filled in with a pale and indistinct irroration of grey-white. A nebulous grey-white submarginal band, more distinct near the apex, and followed by a few white dots between the veins. *Hind wing* smoky grey with a darker and indistinct post-discal line; an indistinct dark submarginal line, which traverses a grey-white patch at inner angle: margin edged with blackish.

Underside smoky grey. *Fore wing* with a dark disco-cellular streak and some indistinct yellowish marks distally, which form a submarginal line interrupted in the middle; some yellowish scaling beyond the cell and at the apex. *Hind wing* with pale spot at anal angle and no other markings.

Thorax grey-brown; antennæ, head, and abdomen smoky grey; legs and underside paler.

Length of fore wing 20 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, March. 1 ♂.

Paralcis costimacula, sp. n.

(Pl. IV. fig. 17.)

♀. *Upperside*.—*Fore wing* with yellowish-brown ground-colour, dusted with black. A black and well-marked dentate

basal line more heavily marked on costa and at inner margin ; a faint median line angled outward at vein 2 ; a quadrate snow-white costal patch reaching below vein 5, and its greater part lying within the cell ; a waved post-discal line outwardly angled at vein 4, its upper part traversing the costal patch and more heavily marked, its lower part somewhat obscured by forming the outer edge of part of the median black band ; a blackish median band, its inner edge below vein 2 defined by median line and its outer edge by the post-discal line, anteriorly slightly invading cell and filling inner two-thirds of cellule 3, and at base of vein 4 is joined to a black apical area ; on inner margin at the outer edge of the median line is a small white spot ; a pale submarginal line, irregularly dentate and white at the costa ; below vein 2 a black apical area reaching vein 4, and leaving a narrow band of ground-colour distally of the white costal patch, also a narrow marginal edging ; a series of black marginal dots proximally rounded and separated by the veins ; fringe smoky grey, at veins 3 and 4 yellow-white. *Hind wing* smoky grey with a slightly darker marginal band.

Underside smoky grey. *Fore wing* with a post-discal band of pale orange with spots of ground-colour, its inner edge not entering cell, straight, and at right angles to costa, its outer edge rounded but invaded by ground-colour.

Head and thorax smoky grey, antennæ yellowish brown ; legs and abdomen greyish brown.

Hub. Arfak Mtns., Angi Lakes, 6000 feet, Jan.-Feb. 1 ♀.

Paralcis lituata, sp. n.

(Pl. III. fig. 6.)

This species is strongly reminiscent of *Paradromulia ambigua*, Warr.

♂. *Upperside*.—*Fore wing* brownish ochreous much irrorated with black. Two black basal lines ; a dark discal area, its upper part bounded by a black post-discal line ; post-discal line at right angles to costa and curving inwardly below vein 4, thence straight from vein 2 to inner margin ; upper part of post-discal line separated from a dark distal area by a costal stripe of ground-colour which is joined to a similar stripe filling outer two-thirds of cellule 3 ; a thick distal line of ground-colour nearly parallel with outer margin, and shortly hooked anteriorly and proximally contingent here with a small apical patch of ground-colour ; a

thin white subterminal line, very irregular and very faint in its middle part; a black marginal line. *Hind wing* grey-white, much irrorated with brownish ochreous except in costal area. A dark basal line; a discocellular spot; two crenulate post-discal lines, the outer more faintly marked; a thick subterminal line bordering a darker marginal area; a black marginal line.

Underside brownish ochreous with markings on upperside showing through.

Antennæ, head, thorax, and abdomen brownish ochreous; legs ochreous banded with brown.

Length of fore wing 21 mm.

Hab. Angi Lakes, Arfak Mtns., 6000 feet, Jan.-Feb. 2 ♂♂.

Craspedosis prouti, sp. n.

(Pl. III. fig. 3.)

♀. Wings above and below plumbagineous. *Fore wing* with a pale orange discal band from vein 10 to vein 1 *a* or before it, narrowing posteriorly and variable in width; it enters cell and inner edge is oblique, outer edge angled at vein 4.

Thorax blue-black; head, antennæ, abdomen, whole underside, and legs grey.

Length of fore wing 23 mm.

Hab. Wandammen Mtns., 3000-4000 feet, Nov. 2 ♀♀.

Craspedosis scordylodes, sp. n.

(Pl. IV. fig. 18.)

♀. *Upperside*.—*Fore wing* black, with a bronzy sheen. A pale yellow discal band from the costa to close to outer margin below vein 2, broader anteriorly above vein 4, and passing through end of cell. *Hind wing* black with a bronzy sheen at inner margin.

Underside dead black. *Fore wing* with yellow band as above.

Antennæ black; head, thorax, abdomen, and legs dark grey.

Length of fore wing 18 mm.

Hab. Angi Lakes, Arfak Mtns., 6000 feet, March. One specimen.

Xanthomima plumbeomargo, J. & T.

X. plumbeomargo, Joicey & Talbot, Trans. Ent. Soc. Lond. 1916 (Aug.), p. 82 (Schouten Islands).

Mr. L. B. Prout informs us that this species must sink to

Xanthomima (*Eusemia*) *melanura*, Kirsch. Mitth. Zool. Mus. Dresden, ii. pp. 130-131, pl. vii. fig. 3 (1877) (Kordo, Schouten Is.).

Eucharidema arfaka, sp. n.

(Pl. III. fig. 1.)

Similar to *aroensis*, Roth.*, and *euanthes*, Prout†. Agrees with *aroensis* in the white band of the hind wing, which is absent in *euanthes*. Differs from *euanthes* on the fore wing in the well-marked posterior fork of the subterminal line, in the stripe in cellule 3 being perceptibly forked at its distal end, and the orange patch below being reduced proximally. It resembles the differently looking *labyrinthodes*, Prout‡, in the fork of the subterminal line, and the reduced orange patch on the underside.

♂ ♀. *Upperside*.—*Fore wing* with ground-colour black strongly irrorated with chocolate-brown, which is less at base and outer margin. A distinct thin basal line of chocolate-brown, a subterminal irregular line which runs parallel to margin from costa near apex to vein 4, then curves inwards and is oblique to inner margin; it is joined to another line at the middle of vein 3, this line going to the tornus, and it is sometimes connected with a curved mark outside it in cellule 2. A white postcellular bar or line, reduced to a pale thin line in two specimens, runs just beyond cell from centre to vein 4 and is slightly curved. The whole of cellule 3 is filled in with chocolate-colour, and this extends more or less definitely as a bar across end of cell. There is a small triangular patch of chocolate-colour on margin below apex, and this usually cuts off a black apical patch. *Hind wing* plumbagineous with a narrow white postcellular band from costa to vein 4; it narrows posteriorly and is sometimes obsolescent to inner margin.

Underside plumbagineous. *Fore wing* darker in distal half. A broad orange-yellow subapical band from costa to vein 2, slightly invading cell, widest in cellule 3, outer edge more irregular than the inner. *Hind wing* without markings.

Head, thorax, and abdomen smoky brown above, paler below; antennæ pale brown; legs grey.

Length of fore wing 24 mm.

* *Boarmia aroensis*, Roths. Nov. Zool. xi. p. 322, pl. iii. fig. 29 (1904).

† *Eucharidema euanthes*, Prout, Nov. Zool. xxiii. p. 67 (1916) (Mt. Goliath).

‡ *E. labyrinthodes*, Prout, l. c. p. 68 (Mt. Goliath).

Hab. Arfak Mtns., Angi Lakes, 6000 feet, Jan.—March.

8 ♂ ♂, 2 ♀ ♀.

E. euanthes, Prout, and *E. labyrinthodes*, Prout, were taken at the same locality.

Uraniidæ.

Cyphura wrapteroides, sp. n.

(Pl. III. fig. 16.)

♀. *Upperside*.—*Fore wing* with distal half dark grey; proximal half white, traversed by a dark grey median band, leaving a narrower white outer band; median band broader anteriorly with an incurved distal edge and nearly straight inner edge; costa speckled with black except at apex. *Hind wing* white with a broad terminal band of dark grey, narrowing to inner angle; margin bordered with white ending in a fine line at apex and towards inner angle, but in cellule 3 very broad and less so in 2, bearing in each cellule a rounded black marginal spot; a faint greyish patch above the inner angle, anteriorly diffused but distally defined.

Underside.—*Fore wing* with blackish-grey distal half. An anterior basal triangular patch of dark grey which fills the cell and the base of cellule 2, its outer edge continued as a faint line to the inner margin. *Hind wing* with a darker and broader terminal band; margin thinly edged with white except between veins 4 and 6, where it is broadly edged; a faint greyish inner marginal patch as above.

Antennæ grey-brown, the shaft dotted with white on upper side; palpi black, white on the outside; head black, frons edged with white; thorax white; abdomen grey-white; legs grey-white, fore- and mid-tibiæ dark grey.

Length of fore wing 18–21 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. 2 ♀ ♀.

Lasiocampidæ.

Trabala viridana, sp. n.

(Pl. III. fig. 11.)

Allied to *irrorata*, Moore*, from Java, Malay Pen., and Borneo.

Mr. H. T. G. Watkins has kindly allowed us to examine a ♂ of *irrorata* in his collection from Malacca. It is larger than

* *Trabala irrorata*, Moore, Trans. Ent. Soc. Lond. (1884), p. 375. ♀ (Java).

viridana, the fore wing measuring 22 mm. The outer margin of the fore wing is not crenulate; the discal line is straight; the abdomen is pale buff; the antennæ darker. Species of this genus vary in colour and in development of wing-markings.

♂. Upperside dark green. *Fore wing* with a thin curved brownish basal line; a brown discocellular dot; a thin and strongly waved brownish discal line from about middle of costa, curved outwardly to vein 7, thence obliquely inwards to inner margin proximally of its middle; a brown post-discal line placed as in *vishu*, but more connected. *Hind wing* with a curved discal line and a post-discal zigzag line as on fore wing; inner margin grey-white; cilia ochreous, edged with brown outwardly. Both wings with fringes crenulate.

Head and palpi greenish yellow; antennæ ochreous; thorax green as wings; abdomen grey-white; pectus yellowish green; legs ochreous.

Length of fore wing 18 mm.

Hab. Wandammen Mtns., 3000–1000 feet, Nov. One specimen.

Taragama melanospilotos, sp. n.

(Pl. II. fig. 7.)

Near *purpureocastanea*, Roths.*, but chiefly distinguished by the black area of the hind wing and black upper surface of abdomen.

♂. *Upperside*.—*Forewing* chestnut-brown; a black but indistinct basal and antemedian line, directed distad; a dark post-discal line, directed proximally; an outer post-discal line, slightly angled at 6; a subterminal series of small black spots dusted with grey scaling. *Hind wing* with posterior area to vein 6 black, the remainder chestnut-brown; two black discal lines visible in the brown area. Fringes very short and white.

Underside.—*Fore wing* darker brown with post-discal lines as above. *Hind wing* as above; some grey scaling on the costal edge.

Antennæ sooty grey; palpi, head, and thorax chestnut-brown; abdomen above brownish black, below pale reddish ochreous; pectus and femora ochreous; tibiae and tarsi chestnut-brown, the latter with grey scaling.

Length of fore wing 29–32 mm.

Hab. Wandammen Mtns., 6000 feet, Nov. 2 ♂♂.

* *Taragama purpureocastanea*, Rothschild, Lep. B. O. U. & Woll. Exp. pp. 105–106, pl. 2. fig. 57 (1915) (Utakwa River).

Taragama castanea, sp. n.
(Pl. II. fig. 9.)

♂. Upperside dark chestnut-brown. *Fore wing* with a dark but indistinct basal line and a similar antemedian line; a distinct post-discal line, outwardly curved to vein 5 and then curved inwards, distally edged with pale ochreous below vein 5; a subterminal row of small black spots between the veins, each spot edged proximally with ochreous; margin washed with ochreous near apex and the rest scaled with greyish ochreous. *Hind wing* with a black, indistinct, curved discal line; fringe white.

Underside same colour as above. *Fore wing* with a post-discal line more heavily marked. *Hind wing* with discal line as above and trace of a post-discal line.

Antennæ ochreous; palpi, head, thorax, abdomen, and legs dark chestnut-brown; eyes densely hairy.

Length of fore wing 25 mm.

Hab. Arfak Mtns., Angi Lakes, 6000 feet, Jan.-Feb.

1 ♂.

We place this distinct species, provisionally, in *Taragama*, but it differs from typical forms of that genus in the hairy eyes and the smaller palpi.

Opsirhina melanacra, sp. n.
(Pl. II. fig. 8.)

♂. Upperside reddish brown. *Fore wing* with apical area dusted with greyish black; a straight and oblique blackish post-discal line. *Hind wing* with some greyish-black dusting along the outer margin.

Underside reddish brown. *Fore wing* as above, but with a trace of a subterminal blackish line; some grey dusting at outer angle. *Hind wing* with a darker brown post-discal line; distal margin dusted with grey, formed by an admixture of whitish hairs.

Antennæ black; palpi, head, and thorax rufous; abdomen blackish above, rufous below; legs rufous.

Length of fore wing 15 mm.

Hab. Wandammen Mtns., 3000-4000 feet, Nov. 1 ♂.

Drepanidæ.

Holoreta leucospila, sp. n.
(Pl. III. fig. 12.)

Allied to *Holoreta cervina*. Warr.* Differs in colour of

* *Holoreta cervina*, Warren, Nov. Zool. xiv. p. 97 (1907) (Brit. N. Guinea).

upperside, in the fore wing having a rounded discocellular spot, and oblique line being near the margin.

♂. Upperside vinaceous with a faint white suffusion, and faintly dotted with black. *Fore wing* with a rounded discocellular spot, proximally outlined with white, the spot distinct on account of absence of white scaling; oblique thin black line, distally edged with white, from below apex to inner margin at middle; area distally of oblique line more strongly irrorated with black, especially at apical margin; a rounded cream-coloured spot on inner margin between tornus and post-discal line. *Hind wing* with a faint yellowish basal line and an indistinct yellowish irregular post-discal line.

Underside.—*Fore wing* paler than above, yellowish at inner margin and on costa near apex. *Hind wing* yellowish white with faint vinaceous irrorations.

Antennæ yellowish brown; head and palpi crimson; vertex yellowish brown; tegulæ vinaceous mixed with white; patagia and abdomen vinaceous; abdomen laterally yellowish brown; legs reddish brown with yellowish-brown hair.

Length of fore wing 20 mm.

Hab. Wandammen Mtns., 3000–4000 feet, Nov. One specimen.

Holoreta leucospila f. *flavobscura*, forma n.

(Pl. III. fig. 13.)

♂. Upperside with yellow ground-colour much irrorated and obscured by blackish brown. The hind wing is darkened between the basal and post-discal lines; below this there is a dark suffusion reaching vein 5, and some dark apical markings.

Underside pale yellow, much speckled with black and brown, less so on the hind wing. Post-discal line distinct on both wings.

One specimen from Wandammen Mtns.

Hepialidæ.

The following four forms of *Porina* appear to be undescribed. We are uncertain of their specific distinctness in the absence of more material from New Guinea for comparison.

Porina nigripuncta, sp. n.

(Pl. II. fig. 10.)

♂. Upperside of *fore wing* with ochreous-grey ground-

colour. A black spot in upper part of cell near base, a subbasal mark in 1 *b*, and a dot above it in 1 *c*, an irregular discal line of black spots, the upper one in cellule 8 near base of cellule, the second in 7 more proximal and longer, the third more proximal, on the discocellular and obliquely placed, the fourth in 4, the fifth and sixth conjoined to form a large spot in 2 and 3; a little proximal of the last spot a thin line runs from vein 2 to the inner margin; distal half of wing paler with some dark shading in places; a post-median series of spots and streaks, the three anterior in 7-9 are dark and thin transverse streaks, the middle three in 4-6 are small rounded grey-white spots with a dark edging, the posterior ones are minute, being two dots in 3, a streak in 2, and a dot on the margin in 1 *c*; a second similar row of spots of which only the one in 6 has a pale centre; a third row of four spots in 5-7, there being two minute ones with pale centres in 7, the two below being heavily marked; a fourth row of indistinct spots, of which two minute ones with pale centres in 8 and a heavily marked one in 7, are the most conspicuous; traces of two other rows of markings in the subapical region; distal half of wing paler than proximal half; lower distal part below vein 7 paler than the anterior area. *Hind wing* ochreous; an indistinct series of subterminal dots between the veins.

Underside ochreous; fore wing markings showing through.

Antennæ pale ochreous; palpi brownish ochreous; head and thorax brownish ochreous above; legs ochreous-grey; underside of thorax and abdomen pale ochreous.

Length of fore wing 36 mm.

Hab. Wandammen Mts., 3000-4000 feet, Nov. 1 ♂.

Porina nigricosta, sp. n.

(Pl. II. fig. 11.)

♂. Upperside of *fore wing* fuscous, costa black; basal area of cell yellowish brown and outwardly diffused; some terminal yellowish dusting on anterior half of outer margin; rows of indistinct dark markings and dots with pale centres, as in the preceding species. *Hind wing* ochreous, the lower median area darkened.

Underside ochreous.

Antennæ pale ochreous; head and palpi black; thorax dark brown; pectus greyish ochreous; abdomen ochreous, darker below; legs dark brown.

Length of fore wing 33 mm.

Hab. Wandammen Mts., 3000-4000 feet, Nov. 1 ♂.

Porina subochracea, sp. n.

(Pl. II. fig. 12.)

♂. Upperside of *fore wing* with ochreous-grey ground-colour; basal area tinged with reddish brown, mostly obscured in the type by pale ochreous; costa dark brown to within a fourth from the apex; a broad median longitudinal stripe of pale ochreous from the base to outer margin; this stripe is absent in the co-types, and one of these possesses in its place a narrow blackish stripe; a basal, median, three postmedian, and a subterminal row of pale ochreous spots with blackish centres: the median spot in 1*b* is larger than the others and shows a larger black centre; the second postmedian series consists of 4 small spots in 3-6, the subterminal series is minute, and there is a row of indistinct marginal dots; in two specimens the spots are more or less obsolete. *Hind wing* pinkish ochraceous.

Underside pale ochreous; spots on fore wing indistinctly showing through.

Antennæ pale ochreous; head and palpi brownish ochreous; thorax brownish ochreous; abdomen and pectus pale ochreous; posterior legs pale ochreous, fore- and mid-tibiae and tarsi brownish ochreous, fore- and mid-femora pale ochreous.

Length of fore wing 29 mm.

Hab. Wandammen Mtns., 3000-4000 feet, Nov. 4 ♂♂.

Porina argentipuncta, sp. n.

(Pl. II. fig. 13.)

♂. Upperside of *fore wing* ochraceous and shaded with brown, two specimens being greyish white in the inferior basal and postmedian areas. Costa dark brown. Some silvery spots variable in size; a small one in cell near base, a large quadrate spot in upper angle of cell, and a small one above it; four smaller postcellular spots in 3-6, the one in 5 placed longitudinally; a rounded median spot in 1*b*; three post-discal rows of minute dark spots and dots, with pale edging; the distal ones more or less silvery; a marginal series of dark dots. *Hind wing* pinkish ochreous.

Underside pale ochreous, the lighter spots of fore wing showing through.

Antennæ pale ochreous; head and palpi brownish ochreous; thorax and abdomen ochreous; legs brownish ochreous.

Length of fore wing 27 mm.

Hab. Wandammen Mtns., 3000-4000 feet, Nov. 3 ♂♂.

EXPLANATION OF THE PLATES.

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- Fig. 1. *Asura wandammenensæ*, Joicey & Talbot, Ann. & Mag. Nat. Hist. ser. 8, vol. xvii. p. 83 (1916) (Wandammen Mtns.).
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V.—*New Races and Aberrations of Heliconius.*
 By J. J. JOICEY, F.E.S., and W. J. KAYE, F.E.S.

[Plates V. & VI.]

THE races and aberrations here described are all in the collection of Mr. J. J. Joicey at Witley. It will be noted that we have kept *cydno* as a species, and not treated it as a form of *melpomene* as Dr. Eltringham has maintained in his valuable paper in the Trans. Ent. Soc. 1916, pp. 101–148. While we think his contention is possibly sound, we prefer for the present to keep *cydno* as a separate species, on account of the constant red markings on the underside. If ultimately *cydno* should be definitely proved to be conspecific with *melpomene*, one would expect this red marking on the underside to occasionally occur in *melpomene* races and forms in other geographical areas outside Colombia and adjacent portions of Venezuela. Southwards these forms are unknown; only to the north, in Central America, are they further to be met with. The two forms *eratophylla* and *melpophylla*—the one a subspecies of *erato*, the other a subspecies of *melpomene*—are of more than ordinary interest in the extraordinarily close resemblance they bear to one another, although of a complicated pattern. It is very curious to note that it is the yellow transverse band that has displaced a portion of the streaking in the *erato* form, but has filled up a vacant space

in the *melpomene* form. Thus, without the yellow band the *erato* form becomes *erythraea* as known from French Guiana and the Lower Amazon, and the *melpomene* form similarly becomes *tyche* from the same regions. Yet these two, while probably sufficiently alike on the wing, are obviously different.

Heliconius numata numata, ab. *melanopors*, J. & K.
(Trans. Ent. Soc. 1916).

Fore wing above sienna-brown and black. Inner margin broadly black. Basal half of wing dark sienna-brown, with a large black wedge-shaped mark within the cell directed towards base. A large black discoidal patch and two smaller patches above and below vein 3 close to cell. Transverse band of the same colour as the basal area, but slightly paler. Three subapical spots also of the same colour, and an indication of similar marginal dots. Hind wing above similarly coloured to fore wing. The whole of the outer marginal half of wing black, forming a convex area on its upper edge. A rather small brown spot at apex within the black area.

Hab. French Guiana, Nouveau Chantier.

This is a parallel form to *melanops*, but of the colouring of *mavors*. The occurrence in French Guiana of both these forms is of great interest, as the theory at once suggests itself that possibly *arcuella* (a subspecies of *aristiona*) and with it all the forms usually associated with *aristiona* are all conspecific with *numata*. The drawings by our friend Dr. Eltringham of the genital claspers of *numata* forms (Trans. Ent. Soc. 1916, pl. xiii, figs. 4-6) and *aristiona* forms (id. pl. xiv, figs. 3-9) are sufficiently close to offer no difficulty to such a possibility.

Heliconius numata talboti, J. & K., subsp. n.

Fore wing above with the basal area dark ochreous. Costa black. A large round black blotch within the cell and a wedge-shaped black mark running to base. A very slender curved black streak along vein 1. A narrow, yellow, transverse, irregular band from within the cell to vein 2, stopping some distance short of tornus and embracing a large roundish black blotch between veins 2, 3. A black blotch above this is almost merged in the black ground-colour of the apical half of the wing. An indication of a yellow transverse band from costa beyond cell to meet the first band at vein 2. Two or three yellow subapical patches much suffused with black. A trace of a row of yellowish marginal dots.

Hind wing above dark ochreous, with a tinge of yellowish

beyond the cell. A broad black marginal band containing ill-defined pairs of whitish streaks; the dots on cilia clear white. Across the centre of wing is a black macular band terminating with a yellow spot enclosed by black. Some faint yellow scaling between the black spots composing the band.

Hab. N. Peru, Rentema Falls, Upper Marañon, 1000 ft.; Chinchipe River, 6000 ft., September 1912; Charape, 4000 ft. (*A. & E. Pratt*).

6 ♂♂, 1 ♀.

Heliconius numata silvaniformis, J. & K., subsp. n.

Fore wing above with the basal half ochreous. A very heavy black nail-shaped blotch within the cell. Costa black. A heavy black curved band along vein 1. A large, square, black discoidal blotch joined to the black costal stripe. Space between basal black blotch and discoidal black blotch yellow suffused with ochreous. Beyond discoidal blotch is a transverse yellow band much broken up on its outer edge. Two large black blotches between veins 2, 3 and 3, 4, and touching one another. A heavy black wedge-shaped blotch running up from outer margin touches the upper of the two black blotches at the lower angle. Apex black, with three yellow spots, the two upper ones almost contiguous.

Hind wing above ochreous, with a rather narrow black transverse band. A black marginal band almost uniting with transverse band between veins 3, 4 and thence completely to apex, containing two or three pairs of small yellow spots. A series of marginal yellowish-white dashes.

Hab. Lower Amazon, Para, Jan.-March, 1914 (*A. Hall*).

This insect strongly recalls *silvana diffusa*, from which it may be separated by the heavy black pointed blotch in cell, *silvana* having instead a small round blotch only. Dr. Eltringham has treated *silvana* and *numata* as conspecific, but we cannot follow this for the present.

Heliconius ignotus, J. & K., sp. n.

Fore wing above with the basal half brownish ochreous. A large black wedge-shaped basal streak joined (or sometimes separate) to a large roundish black patch. Costa black and a large black discoidal patch united with the black thorax. A rather narrow discal yellow band ending quite pointedly just beyond vein 2 close to outer margin. In the middle of this band just beyond cell between veins 3, 4 is a rather small black spot, and below vein 3 is a larger black spot.

Sometimes the yellow of the band is extended inwards into the cell and embracing the lower black spot between veins 2, 3. Apex completely black.

Hind wing above brownish ochreous, with very irregular black marginal band, much the heaviest on the inner half. A transverse row of rather elongated wedge-shaped black spots, the last spot merging with the outer margin and curved up towards costa. No yellow terminal spot.

Palpi with first and second joints white below and base of antennæ with white points.

Expanse 78-86 mm.

Hab. N. Peru, Charape, 4000 ft. (*A. E. & F. Pratt*, 1912).

Heliconius aristiona pratti, J. & K., subsp. n.

A small dark race of *H. aristiona* resembling *aristiona aristiona*.

Fore wing above with a large discal area chestnut ochreous extending towards base along costal and median veins. A heavy black streak along inner margin, sometimes stopping halfway. A very heavy black wedge-shaped area within the cell. Discoidal black spot heavy, joined to narrow costal black stripe. A heavy black spot close to cell between veins 2, 3 and a much smaller one between veins 3, 4. Chestnut-ochreous projection of discal band above vein 3 rather narrow.

Hind wing black, with a commencement of a dark chestnut-ochreous (or slightly reddish) marginal band. Inside this is a triangular patch of the same colour.

Expanse 33 mm.

Hab. N. Peru, Charape, 4000 ft. (*A. E. & F. Pratt*, 1912).

It is possible this is an altitudinal race, taking the place of *aristiona aristiona*.

Heliconius clysonimus apicalis, ab. *semirubra*, J. & K., ab. n.

Fore wing above as in typical *clysonimus apicalis*.

Hind wing with a narrow transverse red band rather less than half the width of the normal form even at its widest between veins 2, 3; thence outwardly the band is reduced and gradually merges into the black ground-colour. From vein 2 to inner margin the band is only traceable.

Hab. Colombia, slopes of Choco, 5200 ft., Sept. 1909.

Heliconius aristiona indecisa, J. & K., subsp. n.

Fore wing above with the base to vein 2 brownish ochreous; the costa black, a large black blotch pointed towards base, and a large black discoidal blotch joined to the black costa. A diffuse black curved streak along vein 1 and a small blackish suffused yellow spot at tornus. Ground-colour of apical area of wing black. Beyond the cell is a short yellow band ending at vein 4 and a long elongate yellow spot between veins 3, 4. Three apical yellow patches suffused in the interspaces with dull reddish brown.

Hind wing above brownish ochreous, with a black transverse toothed band and a small yellow spot close to margin just above vein 6. A black marginal band, with pairs of yellowish-white dots between the veins on the margin.

Fore wing below with three pairs of white subapical dashes lying on an ochreous narrow apical band, which is continued down the outer margin.

Hab. Upper Orinoco.

Heliconius numata superioris, ab. *transleta*, J. & K., ab. n.

A transitional form uniting *numata superioris* with *numata numata*, ab. *mavors*.

Fore wing above with the basal half sienna-brown. A large black discoidal blotch extended to costa and united with an irregular black half-band from lower discocellular to outer margin. A light brown postdiscal band. Two or three yellow spots forming apical band and three submarginal yellow dots.

Hind wing above sienna-brown, with a broad black transverse band united at outer margin, where a yellow spot is enclosed, with a broad black marginal band. A series of short yellowish dashes close to margin, conspicuous at centre and lessening towards base and apex.

Hab. Middle Amazon, Manaos, Jan.-Mar. 1914 (A. Hall).

Heliconius erato eratophylla, J. & K., subsp. n.

Fore wing above black, with a large basal area red, only the veins showing black. A heavy red transverse discal band from costa to near tornus, separated from the red basal area by little more than an average of 2 mm.

Hind wing above black, with a broad transverse yellow band and six red streaks crossing it. These are only just

traceable on the yellow band, but are clear and distinct at origin, at base, and beyond the yellow band. Below there is a seventh red streak between veins 7 and 8, this area above being occupied with the brand.

Hab. Peru, Tarapoto.

1 ♀.

The resemblance between this *erato* race and the next following *melpomene* race is truly remarkable, and one of the closest of the close "pairs" to be found amongst the two divisions of the *Heliconius*.

Heliconius melpomene melpophylla, J. & K., subsp. n.

Fore wing above black, with a large basal area red and only the veins showing black. A heavy red transverse discal band from costa to near tornus, connected on the costa with basal red area and almost united again at the median vein. Outer margin of discal band not sharply defined as in *erato* *eratophylla*.

Hind wing above black, with a broad transverse yellow band, slightly scalloped on its outer margin and followed by six nail-headed streaks which commence close to yellow band, but in no case touching. A small red basal area contiguous to the yellow transverse band above and a slight indication of a red streak along the upper edge of band, especially towards apex.

Hab. ?, without doubt Peru.

1 ♀.

This form doubtless flies with *eratophylla* and serves as its model or mimic.

Heliconius erato erato, ab. *cybelellus*, J. & K., ab. n.

Fore wing above black, with a large red basal area which is greatly extended along costa and within the cell. This is followed by a sharply cut (both interiorly and exteriorly) transverse yellow band.

Hind wing black.

Expanse 78 mm.

Hab. Lower Amazon, Serpa, Jan.-Mar. 1914 (A. Hall).

This curious form is a development out of *amalfreda*, in which the group of yellow spots are compressed into a well-defined band.

Heliconius sapho primularis, ab. *deflata*, J. & K., ab. n.

Fore wing above black, with a strong dark blue gloss on basal half. A large subdiscal yellow band commencing within the cell remote from discocellulars and terminating at tornus. A narrow postdiscal band from costa to vein 4, tapering greatly towards margin, concave on its outer edge, and slightly indented on its inner margin.

Hind wing above black, the basal half with a strong dark blue gloss. A broad marginal band of yellowish grey crossed with short black lines on and between the veins.

Expanse 70 mm.

Hab. Ecuador, Paramba.

2 ♂♂, 1 ♀.

The ♂ we figure is the extreme form of the three, the other ♂ and ♀ are more intermediate. Typical *primularis* occurs at Paramba, Ecuador, so this darkened form is there only as an aberration, even if it occurs as a race elsewhere.

Heliconius erato amphitrite, ab. *unipuncta*, J. & K., ab. n.

Fore wing black, with a large bright red discal patch. Lying just outside cell, but contiguous to it along vein 6, is a conspicuous central black spot.

Hind wing black. No blue gloss to either fore or hind wing.

Hab. S.E. Peru, Tirapata.

Heliconius erato rubrizona, J. & K., subsp. n.

Fore wing black, with a narrow discal red band from costa to near tornus, where it ends rather pointedly. The outer edge considerably broken and indented, especially at vein 4. A small inconspicuous black discal dot.

Hind wing black, with two faint red basal dots.

Hab. Lower Amazon, Santarem.

Heliconius cydno flaveola, J. & K., subsp. n.

Fore wing black, with a very dark blue gloss. A somewhat rectangular-shaped yellow spot lying within the outer half of cell and joined to a broad curved yellow band running from costa to tornus.

Hind wing black, with a dark blue gloss; no trace of any marginal spots.

Hab. Venezuela, Mocotone.

This subspecies of *cydno* strongly recalls *cydno broncus*, Stich., from Peru and Ecuador. It is practically identical on the fore wing and only different on the hind wing by the absence of white spots on the margin. Such a form might easily occur with *broncus* as an aberration; but, on the other hand, it might as likely occur as a race and be comparable to *cydno zelinde*, which is practically an identical form, but white-banded instead of yellow. This latter occurs as a race in some western valleys of Colombia, such as the Rio San Juan and Rio Dagua.

Heliconius elevatus perchlora, subsp. n.

Fore wing above black, with a large part of the basal half of the wing red. On inner margin a red streak detached from the large red area. Adjoining the red area within and above the cell is a large roundish yellow discal area extending down beyond vein 2, where it is suffused with black scaling.

Hind wing with streaking rather heavier than in *elevatus elevatus*.

Hind wing below like *elevatus elevatus*, except that the peculiar streak inside the costal vein is more strongly yellow and considerably extended.

Hab. Bolivia.

The locality is very vague, but the specimen suggests that its origin is correct, as it matches *H. melpomene penelope*, a typical Bolivian form.

EXPLANATION OF THE PLATES.

PLATE V.

- Fig. 1.* *Heliconius aristiona indecisa.*
- Fig. 2.* — *clysoninus apicalis*, ab. *semirubra*.
- Fig. 3.* — *numata talboti*.
- Fig. 4.* — *aristiona pratti*.
- Fig. 5.* — *ignotus*.
- Fig. 6.* — *numata superioris*, ab. *translata*.
- Fig. 7.* — — *silvaniformis*.
- Fig. 8.* — *numata numata*, ab. *melanopors*.

PLATE VI.

- Fig. 1.* *Heliconius melpomene melpophylla*.
- Fig. 2.* — *erato eratophylla*.
- Fig. 3.* — *cydno flaveola*.
- Fig. 4.* — *erato erato*, ab. *cybeellus*.
- Fig. 5.* — *elevatus perchlora*.
- Fig. 6.* — *sapho primularis*, ab. *deflava*.
- Fig. 7.* — *erato rubrizona*.
- Fig. 8.* — — *amphitrite*, ab. *unipuncta*.

VI.—*On small Mammals from the Delta of the Parana.*
By OLDFIELD THOMAS.

(Published by permission of the Trustees of the British Museum.)

By the kind hospitality of Cols. Knight and Porteous, and the active help of their manager Mr. James Hunter, Mr. Robin Kemp has been enabled to make a collection at Isla Ella, in the delta of the Rio Parana, at the top of the La Plata Estuary.

So near Buenos Ayres, and in a general region that has been visited by numbers of collectors, one did not expect any novelties, and it has therefore been with the greatest interest that I have found in this little collection no less than three forms which prove to need description, one of these representing a new genus, while there is also a fine series of the striking water-rat *Scapteromys tomentosus*, hitherto wanting in the Museum collections.

The islands where the specimens were obtained are remarkable for the fact that they are more or less completely flooded when a south-east wind banks up the waters of the La Plata Estuary, and Mr. Kemp records that he has had to wade through the rising waters to retrieve his traps, and that then, the water having fallen and the traps been re-set, he has again caught numbers of specimens. This shows, of course, that all the local species have learnt to take refuge in trees, unless they are themselves absolutely aquatic. That such animals as *Oryzomys*, *Oxymycterus*, *Akodon*, and the new genus *Deltamys*, all normally terrestrial, should thus have become arboreal on occasion, is a remarkable case of adaptation to local conditions.

Neither the burrowing tuco-tuco (*Ctenomys*) nor the common "laucha" (*Hesperomys*) are contained in the collection, and they have no doubt been unable to live in so water-logged a region.

The collection consists of forty-eight specimens, and would have been more had not one of Mr. Kemp's cases fallen a victim to barbarian methods of warfare, and been sunk in the R.M.S. 'Drina.' Happily the lost box does not appear to have contained any species unrepresented in that which safely arrived.

In this connection I should like to express the obligation that the National Museum is under to the authorities of the

Royal Mail Steam Packet Company, who have assisted Mr. Kemp's exploration in various very material ways.

1. *Holochilus vulpinus*, Brants.

♂. 2789, 2813, 2824; ♀. 2832, 2835.

These and the specimens of *Scapteromys tomentosus* are practically topotypes of their respective species, as Sello was said to have collected both types on the Rio Uruguay, and the water of that river washes the lower (eastern) end of the islands of the Parana delta.

2. *Scapteromys tomentosus*, Licht.

♂. 2815, 2817, 2818, 2819, 2826, 2829, 2842, 2843; ♀. 2804, 2814, 2828, 2831, 2834, 2839; and one ♀ in spirit.

This series forms a very valuable addition to our collections, for although discovered on the R. Uruguay as long ago as 1827, the species has never hitherto been sent home to us. Even the genus was only represented by the type of *S. tumidus*, Waterh., from Maldonado (*C. Darwin*), and one skin, with imperfect skull, of the same species from Soriano, Uruguay (*O. V. Aplin*).

Between the two species there does not seem to be any very important skull-character, and *S. tomentosus* would appear to be really a blackish delta representative of the greyer animal of Uruguay.

3. *Oryzomys delticola**, sp. n.

♂. 2845, 2846; ♀. 2812.

A middle-sized species, far larger than *O. flavescens*.

Size and general characters very much as in *O. longicaudatus* of Chili. Colour above lined buffy brown, the light rings on the hairs cinnamon-buff, but the general colour not quite like anything in Ridgway, though nearest to "clay-colour" or "buckthorn-brown." Sides, although a clearer tone than the back, not richly buffy. Under surface greyish white, tinged in one specimen with buffy; the bases of the hairs slaty. Head greyer than back; ears, or at least the proectote, blackish. Hands and feet dull whitish. Tail long,

* This is not a hybrid word, as "delta," although originally Greek, was incorporated into Latin as a declinable substantive.

slender, finely scaled, brown above, whitish below, the usual narrow dark line perceptible along the lower side.

Skull of about the same size as in *O. longicaudatus*, markedly larger than in *O. flavescens*. The interorbital region broader than in the first-named, its edges sharply square, but not ridged. Zygomatic plate rather less projected forward. Palatal foramina ending just opposite the front edge of *m*¹.

Incisors directed backwards towards the throat, their angle with the tooth-row about 65°. Molars rather larger than in *longicaudatus*.

Dimensions of the type (measured in flesh):—

Head and body 105 mm.; tail 125; hind foot 28; ear 17.

Skull: greatest length 27·5; condylo-incisive length 23·2; zygomatic breadth 14·4; nasals 10·2; interorbital breadth 4; breadth of brain-case 12·5; palatilar length 11·5; palatal foramina 6; upper molar series 4.

Type. Adult male. B.M. no. 17. 6. 1. 23. Original number 2846. Collected 17th February, 1917.

This second species of *Oryzomys* is an unexpected discovery, for all over Uruguay and Argentina (apart from the far south) only one species—*O. flavescens* or a member of that group—has hitherto been known, and *O. delticola* would seem to be quite isolated in the present locality.

It would appear to be most nearly allied to the Chilean *O. longicaudatus*, and thus bears the same geographical relationship to that animal that the Parana coypu does to the Chilean one.

4. *Oryzomys flavescens*, Waterh.

♂. 2825; and a ♀ in spirit.

This, the only non-peculiar mouse in the delta, is widely distributed over Uruguay and Middle Argentina. Specimens vary very much in coloration, the under surface of some being strongly buffy and of others white, but extremes and all intermediate phases are found in the same localities.

5. *Akodon arenicola hunteri*, subsp. n.

♂. 2821, 2822, 2833, 2837, 2841, 2847; ♀. 2823, 2838; and one ♀ in spirit.

Like true *arenicola* in colour and other characters, but averaging decidedly larger, the hind foot 21–22 mm. in length, while in *arenicola* it is ordinarily 18–19, rarely reaching 20;

and the skull 24-25.5 mm. in condylo-incisive length, that of *arenicola* ordinarily 22.5-23.5, exceptional specimens just surpassing 24.

Dimensions of the type (measured in flesh):—

Head and body 101 mm.; tail 81; hind foot 21.5; ear 13.5.

Skull: greatest length 27.7; condylo-incisive length 25.5; zygomatic breadth 13.6; palatilar length 12; palatal foramina 6.7; upper molar series 4.5.

Type. Old male. B.M. no. 17. 6. 1. 28. Original number 2841. Collected 12th February, 1917.

Named in honour of Mr. James Hunter, the Managing Director of the Isla Ella Fruit and Forest Company, to whose help and kindness Mr. Kemp was so greatly indebted during his visit to the Delta.

Akodon arenicola, the commonest mouse of the Argentine, occurs in numbers in every collection that we have received from the area between Goya, Corrientes, in the north, and Bonifacio, Buenos Ayres, in the south, in Southern Uruguay, and Eastern Buenos Ayres, and it is everywhere of very uniform size and coloration. Only here, almost in the centre of its general range, but under exceptional local conditions, there is so considerable an increase in its size as to deserve recognition by name.

"From the osiers"; "from an overgrown orchard"; "from the virgin jungle-growth"; "from withy beds."—*R. K.*

6. *Deltamys kempi*, gen. et sp. n.

♂. 2836, 2840, 2848; ♀. 2830.

DELTAMYS, gen. nov.

External characters as in *Akodon*, claws and fur normal. Eyes small. Skull remarkably narrow, both as regards the breadth of the cranium and the lateral spread of the zygomata; zygomatic breadth less than half the condylo-incisive length. Supraorbital edges rounded or with a mere trace of the normal squaring. Zygomatic plate scarcely projected forwards. First upper molar with anterior notch. Second upper molar with the small antero-external cross-ridge obsolete.

Genotype: *Deltamys kempi*, sp. n.

This genus is clearly one of the Akodont series, of which

a general arrangement was published last year*. It is probably most nearly allied to *Akodon* itself, but the remarkable narrowness of the skull, the small zygomatic spread, the reduction of the zygomatic plate, and the simplification of the teeth, notably of m^2 , all indicate sufficient peculiarity to prevent the species being included in that genus.

As a ready means of identification the fact that the zygomatic spread is less instead of more than half the condylo-incisive length will enable *Deltamys* to be distinguished from all the genera mentioned in my key.

The teeth seem to be somewhat simpler in structure than in the known forms, but more specimens will be needed before the value and constancy of this character can be determined, for only one of the four specimens of *D. kempi* has the teeth unworn enough to show the structure. But certainly this specimen exhibits a very distinctive difference in the reduction, practically to nil, of the small cross-ridge at the front outer corner of m^2 —a ridge present, and generally far more conspicuous than in *Akodon*, in most S.-American Muridæ.

The following is a description of the species :—

Size rather smaller than in *Akodon arenicola*, form decidedly more slender. Fur of normal character and medium length, hairs of back about 8–9 mm. long. General colour above blackish brown, inconspicuously washed on head, fore-back, and sides with drabby or olivaceous, nearly unmixed black on the median part of the hind back. One specimen, however, is more olivaceous throughout, and so far as body-colour is concerned might be taken for a rather dark-coloured individual of *A. arenicola*. Under surface dull brownish grey, the hairs slaty basally, their tips brownish on belly, greyer on the chest; a marked wholly white patch on the chin. Eyes rather small, without lighter ring round them. Ears short, well-haired, blackish brown. Hands and feet dark brown; claws normal in length, the pollex with a nail. Tail rather shorter than head and body, thinly haired, finely scaled (15 rings to the cm.), dark brown throughout.

Skull slender, remarkably narrow, with but slightly expanded zygomata. Interorbital region smooth, convex, unridged, its edges scarcely squared. Brain-case narrow, smooth, and rounded. Interparietal much reduced, scarcely perceptible at all in three of the specimens, and a mere narrow strip in the fourth. Zygomatic plate narrow, scarcely projected forwards. Palatal foramina long, well open, not

* Ann. & Mag. Nat. Hist. (8) xviii. p. 336.

specially narrowed behind. Mesopterygoid fossa broad, twice as wide at its anterior end as the base of the narrow pterygoids on each side of it; in most members of the Akodont group the base of each pterygoid is as broad as the fossa between the two. Bullæ small, as in *Akodon*.

Incisors rather thrown forward, their angle with the molar surface 80° – 83° . Molars light and slender, their structure as already referred to.

Dimensions of the type (measured in flesh):—

Head and body 89 mm.; tail 85; hind foot 22; ear 13.

Skull: greatest length 25·6; condylo-incisive length 24; zygomatic breadth 11·7; nasals 9·2; interorbital breadth 4·4; breadth of brain-case 10·8; palatal foramina 5·7; breadth of mesopterygoid opening 1·5; upper molar series 4.

Type. Adult male. B.M. no. 17. 6. 1. 35. Original number 2830. Collected 1st February, 1917.

This little blackish mouse is a most interesting addition to the fauna of Eastern Argentina, being so very different from any other animal known there. Like *Oxymycterus tomentosus*, similarly dark-coloured, it is no doubt peculiar to the marshy and water-logged region of the Parana delta, and has on this account escaped discovery until Mr. Kemp's visit to the islands.

"From neglected orchard"; "from the jungle pajanal."
—R. K.

7. *Oxymycterus platensis*, Thos.

♂. 2827, 2844; ♀. 2820.

8. *Myocastor coypus bonariensis*, Geoff.

Two skulls.

9. *Cavia pamparum*, Thos.

Four skulls.

10. *Blastocerus dichotomus*, Ill.

♀. 2850.

"Presented by Mr. F. E. Welch.—Snared by a quintero."
—R. K.

11. *Lutreolina crassicaudata*, Desm.

♂. 2811, 2816.

VII.—*Notes on the Hymenopterous Families Bethyridæ and Rhopalosomidæ.* By ROWLAND E. TURNER and JAMES WATERSTON.

Bethyridæ.

Pristocera subrufescens, sp. n.

♂. Niger; mandibulis, antennis dimidio basali, tegulis pedibusque brunneo-testaceis; abdomine fusco-ferrugineo; alis flavo-hyalinis, venis testaceis, stigmate fusco.
Long. 5.5 mm.

♂. Head subrectangular, longer than broad, slightly rounded at the posterior angles, shining, coarsely but not closely punctured, without a frontal sulcus. Eyes separated from the hind margin of the head by a distance fully equal to their own length; posterior ocelli near together, much nearer to each other than to the hind margin of the head. Scape rather strongly curved, second joint of the flagellum distinctly longer than the third or fourth, the first subglobose, about half as long as the second. Mandibles bidentate at the apex below, with a third tooth above forming a broad cutting-edge. Pronotum no longer than the mesonotum and scutellum combined, narrowed anteriorly, shining, coarsely but sparsely punctured; mesonotum sparsely punctured, the parapsidal furrows distinct; the hind margin of the pronotum rather broadly depressed; scutellum shining, sparsely punctured. Median segment a little longer than broad, not margined, rounded at the apex, finely punctured-reticulate, with a low median carina from the base not reaching the apex and not continued on the posterior slope, the base of the segment coarsely reticulate; the sides of the segment very finely obliquely striated. Abdomen elongate-fusiform, almost smooth, with a few scattered punctures on the apical segments. Hind tarsal unguis (fig. 1, c) strongly curved, with one slender acute tooth at the middle of the inner margin, one strong bristle at the base, and two externally before the median tooth. Basal joint of the hind tarsus with a scopula of hairs beneath intermixed with stout bristles. Submedian cell a little longer than the median; first brachial cell ill-defined, not closed at the apex; radius nearly three times as long as the basal nervure.

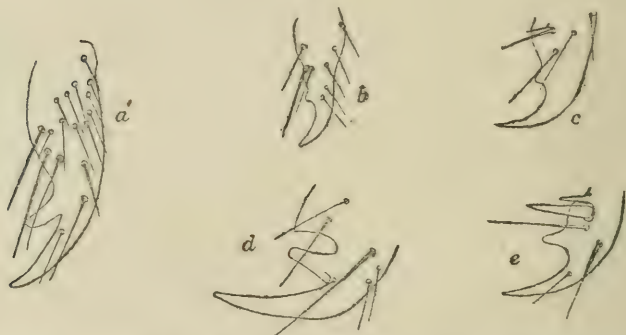
Hab. Natal, Durban (*F. Muir*).

Pristocera neavei, sp. n.

♂. Niger; mandibulis, antennis dimidio basali, tegulis, trochanteribus, femoribus apice, tibiis tarsisque brunneo-testaceis; alis hyalinis, venis testaceis, stigmatibus radioque fuscis.
Long. 5-6 mm.

♂. Head a little longer than broad, shining, evenly and rather deeply, but not closely, punctured, subrectangular, rounded at the posterior angles, without a frontal sulcus. Eyes separated from the posterior margin of the head by a distance equal to about half of their own length; posterior ocelli a little further from the hind margin of the head than from each other. Scape moderately curved, second joint of

Fig. 1.



Hind tarsal unguis of (a) *Epyris muiri*, sp. n., (b) *Epyris elongatula*, sp. n., (c) *Pristocera subrufescens*, sp. n., (d) *Rhabdepyris æthiops*, sp. n., (e) *Pristocera neavei*, sp. n.

the flagellum equal to the third, about twice as long as the first. Mandibles as in *P. subrufescens*, but with the second tooth shorter. Pronotum scarcely as long as the mesonotum, shining, sparsely, but not very finely, punctured, rounded anteriorly; mesonotum very sparsely punctured, with two strong parapsidal furrows; scutellum smooth, with a few punctures on the sides. Median segment half as broad again at the base as long, rounded at the apex, margined laterally but not apically, very finely rugulose, with a carina from the base reaching nearly to the middle of the segment; on each side of the carina at the base are a number of short longitudinal striæ which are separated from the rugulose portion

of the segment by a number of very fine and close oblique striæ. Abdomen with a short petiole, which is about twice as long as the hind trochanter; smooth and shining, with a few punctures on the apical segments. Hind tarsal ungues (fig. 1, e) very similar to *P. subrufescens*, but with the median tooth longer and stouter and the basal bristle developed into a strong spine. Submedian cell scarcely longer than the median, brachial cell absent, radius about twice as long as the basal nervure.

Hab. Portuguese East Africa, Kola Valley, east of Mount Chipirone, 1700 ft. (*S. A. Neave*), November 1913.

Epyris muiri, sp. n.

♂. Niger; mandibulis, tegulis, tibiis anticis, tarsisque brunneo-testaceis; alis subhyalinis, venis testaceis, stigmatibus radioque fuscis.

Long. 5.5 mm.

♂. Head distinctly broader than long; finely and rather sparsely punctured, shining, without a frontal sulcus. Eyes separated from the hind margin of the head by a distance scarcely equal to half of their own length; posterior ocelli about twice as far from each other as from the hind margin of the head. First joint of the flagellum extremely short, second a little shorter than the third, second and scape subequal. Mandibles oblique at the apex, with five blunt teeth, the inferior one much the largest; elongate, subconcave on the upper and lower edges; behind each of the four smaller teeth are one or two stout bristles. Pronotum as long as the mesonotum and scutellum combined, rounded anteriorly, shining, with sparse piliferous punctures; mesonotum with very distinct parapsidal furrows; scutellum smooth and shining, with a fovea on each side at the base. Median segment margined laterally and at the apex, nearly twice as broad as long, opaque, very minutely and closely transversely striolate; with an enclosed median space bounded by two converging carinæ which are twice as far apart at the base as at the apex, a strong median carina from base to apex, the space between the carinæ longitudinally rugulose; surface of the apical truncation very finely and closely transversely striolate, with a low longitudinal carina; sides of the segment smooth and shining at the base, finely aciculate at the apex. Two basal dorsal segments smooth and shining, the remainder with sparse piliferous punctures. Hind tarsal ungues

(fig. 1, *a*) with one large tooth at about two-thirds from the base, sparsely clothed with stiff bristles, three of which at one-third from the base are very long. Basal joint of hind tarsi clothed beneath with very short hairs, among which, near the base, are one or two spinose bristles. Submedian cell longer than the median; radius about twice as long as the basal nervure.

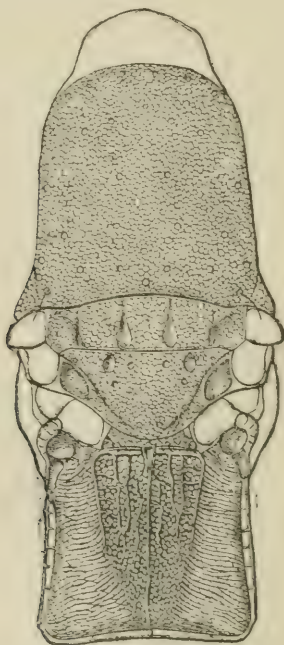
Hab. Natal, Durban (*F. Muir*).

Epyris elongatula, sp. n.

♀. Nigra; mandibulis, scapo, flagello articulis quatuor basalibus, femoribus anticis, tibiis tarsisque brunneo-testaceis; tegulis testaceis; alis hyalinis, venis testaceis.

Long. 3.5 mm.

Fig. 2.



Thorax and propodeon of *Epyris elongatula*, sp. n.

♀. Head longer than the greatest breadth, about half as long again as the breadth on the hind margin, shining, finely

and very sparsely punctured, without a frontal sulcus. Eyes separated from the hind margin of the head by a distance slightly exceeding half of their own length; the posterior ocelli situated on the hind margin of the head. First joint of the flagellum a little longer than the third, a little more than half as long again as the second. Thorax shining; pronotum distinctly longer than the greatest breadth, broadly rounded anteriorly; mesonotum with well-defined parapsidal furrows; scutellum with a fovea on each side at the base. Median segment (fig. 2) as broad as long, the dorsal surface distinctly margined apically and laterally, smooth at the sides and apical angles, with a low median carina extending to the apex, an elongate triangular area bounded at the base by low convergent carinæ which do not reach the apex finely and irregularly reticulate; the sides of the segment and the surface of the apical truncation almost smooth. Abdomen smooth and shining. Submedian cell no longer than the median, nervulus nearly twice as long as the basal nervure; radius about half as long again as the nervulus and basal nervure combined. Tarsal unguis with a small tooth at right angles to the unguis just beyond the middle, the unguis (fig. 1, *b*) behind the tooth slightly swollen.

Hab. German East Africa, north of Handeni (Dr. W. A. Lamborn).

On outskirts of *Glossina pallidipes* area.

Rhabdepyris æthiops, sp. n.

♀. Nigra; mandibulis, scapo, flagello articulis duobus basalibus, tegulis pedibusque ferrugineis; segmentis abdominalibus tribus apicalibus rufo-ferrugineis; alis hyalinis, leviter infuscatis; venis testaceis, costa, stigmate radioque nigris.

Long. 6 mm.

♀. Clypeus subtriangular, blunt at the apex; head longer than broad, opaque, very closely and rather finely punctured; with a distinct longitudinal frontal sulcus, which does not reach to the anterior ocellus. Eyes slightly hairy, separated from the hind margin of the head by a distance about equal to half of their own length; posterior ocelli a little further from the hind margin of the head than from each other. Scape curved, as long as the three basal joints of the flagellum combined; second joint of the flagellum a little longer than the third or fourth, the first and second joints subequal. Mandibles oblique at the apex, with five teeth, the outer one large and pointed, the second blunt and fairly large, the

remaining three very small; on the inner surface of the mandible beginning at the second tooth is a subapical row of bristles. Thorax opaque, with sparse and rather large piliferous punctures; pronotum nearly twice as long as the mesonotum, narrowed anteriorly; mesonotum with two well-defined parapsidal furrows; scutellum with a deep transverse groove at the base. Median segment about half as broad again as long, margined laterally and at the apex, finely and closely transversely striolate; the enclosed median space twice as broad at the base as at the apex, with five strong longitudinal carinae, the space between the carinae with low transverse striae forming reticulations; sides of the segment very finely obliquely striolate; the surface of the posterior truncation subconcave, finely aciculate, with a median longitudinal carina. Abdomen smooth and shining, with a few scattered punctures on the third and fourth dorsal segments. Hind tarsal unguis (fig. 1, *d*) strongly bent, produced at the base into a strong tooth-like lobe; with one tooth which rises at right angles; the apical tooth very long and acute, about twice as long as its basal breadth; on the external surface of the unguis are three bristles—one on the dorsal edge above the base of the median tooth, a second subventrally on the basal projection, and a third between the two. Submedian cell longer than the median; radius at least three times as long as the basal nervure.

Hab. Natal, Durban (*F. Muir*).

Rhabdepyris troglodytes, sp. n.

♀. Nigra; mandibulis, scapo apice, flagello articulis duobus basilibus, tegulis, pygidio, tibiis tarsisque testaceis; alis hyalinis, venis testaceis, stigmatibus fusco.

Long. 4 mm.

♀. Head longer than the greatest breadth, somewhat narrowed behind the eyes, nearly twice as long as the breadth on the hind margin, finely shagreened, with a few scattered piliferous punctures. Eyes separated from the hind margin of the head by a distance scarcely exceeding one-third of their own length; the posterior ocelli situated close to the hind margin of the head. No frontal sulcus. Thorax subopaque; pronotum distinctly broader posteriorly than the greatest length, rather strongly narrowed and rounded anteriorly, finely but not very closely punctured; parapsidal furrows not extending over the whole length of the mesonotum, the inner furrow linear, very narrow, the outer one forming a

broad depression ; scutellum with a deep transverse sulcus at the base. Median segment nearly half as long again as broad, margined at the sides and at the apex, very finely and closely transversely striated, with five longitudinal carinæ, the median one reaching the apex, the two lateral extending beyond the middle, the two intermediate not reaching the middle ; the sides of the segment and the surface of the apical truncation almost smooth. Abdomen shining, the fifth and sixth dorsal segments with scattered punctures. Fore wing with the medius short, which causes the basal nervure and the nervulus to meet at an acute angle, forming two sides of an equilateral triangle ; stigma small ; radius long.

Hab. British East Africa, Voi, 1800 ft. (S. A. Neave), March 21-23, 1911.

Family Rhopalosomidæ.

Genus OLIXON, Cam.

Olixon, Cam. Biol. Centr.-Amer., Hymen. i. p. 412 (1887).

Saphobethylus, Kieff. Ann. Soc. Sci. Bruxelles, xxxv. p. 216 (1911).

Type of the genus, *O. testaceum*, Cam.

Saphobethylus pallidus, Kieff., is a synonym of *Olixon testaceum*.

Cameron places this genus in the Braconidæ, expressing strong doubt as to the true relationship of the genus, and noticing a general resemblance to the Bethylidæ. Kieffer places it in the Bethylidæ without comment on the abnormal characters. The antennæ are 13-jointed in the male, 12-jointed in the female, very long and slender, agreeing well with *Rhopalosoma*, with which the genitalia of the male also show close affinities. It differs from that genus in the entire eyes, in the absence of ocelli, in the rudimentary wings, and in the subsessile abdomen. The tarsi of the female do not show strongly broadened joints as in *Rhopalosoma*. Though these differences remove *Olixon* from very close relationship with *Rhopalosoma*, it seems to be sufficiently near to be placed in the same family. With regard to the affinities of the family, it must be pointed out that the genitalia show a very distinct relationship to those of the Eumenidæ and differ strongly from those of all other Hymenoptera. Thus, of the many attempts to assign a place to the group, that of Westwood, who connects it with the Vespidæ, is the most correct. It is almost certainly derived from the same stock as the Eumenidæ, but strongly modified by nocturnal and

probably also by parasitic habits. The wide range of the family points to considerable antiquity, though it seems to be absent from Australia.

Ashmead (Trans. Ent. Soc. London, p. 235, 1900) assigns *Olixon* to the Bethyridæ, subfamily Emboleminæ, but gives no reason for placing it in that position, from which the very different antennæ seem to exclude it at once. It is by no means certain that Ashmead had seen specimens.

VIII.—*New Geometridæ in the Joicey Collection.*

By LOUIS B. PROUT, F.E.S.

[Plate VII.]

IN working through the Geometridæ in the collection of Mr. J. J. Joicey I have already come across several novelties, some of them of great interest, and as there is now sufficient material for a Plate—which Mr. Joicey, with his customary munificence, has provided in further elucidation of the species and forms—we think it desirable to publish them without further delay. As all the types are in his collection, it is unnecessary to specify this in each individual case.

Subfam. *ÆNOCHROMINÆ*.

1. *Phellinodes biapicata*, sp. n.
(Pl. VII. fig. 5.)

♂.—36 mm.

Head and body white, slightly clouded with brown and irrorated with blackish; palpus blackish on upper and outer side.

Fore wing white, faintly clouded with brown and with moderate blackish irroration, which in places (especially near base) shows some tendency to form transverse strigulæ; a slightly curved blackish mark from hind margin nearly to M^2 just proximal to middle of wing; an elongate blackish cell-mark accompanied by indications of an irregular median line, crossed behind M^2 by a thick longitudinal dash which almost reaches termen and is followed posteriorly by some smoky shading; a large, irregularly bounded apical brown spot, posteriorly extending across R^2 , proximally in places almost reaching the cell, at about 4 mm. from apex traversed

by a thick, slightly curved mark from near costa about to R^2 ; some small dark spots near termen; elongate dark terminal marks at vein-ends; fringe weakly dark-spotted.

Hind wing without distorted venation; white, densely irrorated with blackish, but with a broad elongate clear patch in middle from base to at least three-fourths, bounded anteriorly by SC and R^1 , posteriorly by SM and M^1 , somewhat rounded at its end; a clear apical patch.

Underside similar, but with the entire posterior region of the fore wing smoky, the abdominal margin of the hind wing for a width of 2 mm. mostly white, with dark irroration and with some dark interruption about R^2 and the submedian area.

Contamama, Rio Ucayali, Peruvian Amazons (J. C. Mounsey).

Near *gratiosa*, Schaus; the wings shorter, the markings less sharply defined, but distinguished especially by the white apical patch of hind wing.

2. *Phellinodes leucoplethes*, sp. n.
(Pl. VII. fig. 28.)

♂.—32 mm.

Face white, sprinkled with blackish brown. Palpus with first joint predominantly white, second and third predominantly blackish brown. Antenna blackish, with ciliation rather long (exceeding diameter of shaft). Thorax white, mixed with blackish above. Abdomen above mostly blackish, beneath white.

Fore wing in anterior and distal part blackish brown, posteriorly to the cell and beyond white, the white area being bounded from about the origin of M^1 to anal angle by a fairly regular curve; the blackish area irrorated with white in proximal half and containing two large white spots distally, one from costa to R^1 , broadest (4 mm.) at costa, its proximal edge reaching middle of costa, the other smaller, more distal, from R^2 nearly to SC^5 ; the white area slightly dusted with blackish near base.

Hind wing without distorted venation; white, slightly dusted with blackish brown near base and with a narrow distal border, narrowest about R^1 - R^2 and at tornus, slightly and gradually broadening between these points and apically.

Underside similar, but with the dark brown areas all irrorated with white and with the costal edge of hind wing dark-speckled.

Rio Pastaza, E. Ecuador (*M. G. Palmer*): Alpayacu, 3600 feet (type); El Rosario, 4900 feet. Also two worn ♀♀ from Intaj, Ecuador (*Buckley*), rather larger, with antennal ciliation short. All ex coll. H. Druce.

Subfam. *HEMITHEINÆ*.

3. *Mimandria cataractæ*, sp. n.
(Pl. VII. fig. 25.)

♂.—34 mm.

Face black. Palpus whitish, with third joint and most of second blackish above. Tongue present, but quite short. Vertex and front of thorax mostly light brown; body otherwise whitish grey, irrorated with light brown.

Fore wing broad, with termen rather less oblique than in *insularis*; SC^2 anastomosing at a point with C and with SC^2 ; whitish grey, irrorated with darker grey and with light brown, costal margin mostly dark grey; lines blackish grey; antemedian at nearly one-third, shallowly lunulate outward in cell and in submedian area; postmedian slender, 3-4 mm. from termen, lunulate-dentate, a little incurved in submedian area, the tooth on R^1 acute, the lunule between R^3 and M^1 more shallow than the adjacent ones; an elongate dark cell-mark, somewhat interrupted in middle; subterminal pale line almost obsolete, accompanied proximally by a small wedge-shaped brown spot between R^1 and R^2 and another behind M^2 , a larger and broader one between the medians, the rest of the series almost or altogether obsolete; triangular blackish terminal dots; fringe rather pale, very weakly marked.

Hind wing with first line wanting; cell-spot brown, rounded, slightly ocellated; the rest as on fore wing.

Underside dirty pale grey, the hind wing rather more whitish; both wings with small cell-spot on DC^3 and ill-defined, somewhat interrupted, dark brown-grey submarginal shade; terminal dots a little weaker and more elongate than above.

Victoria Falls, Rhodesia (*E. H. Druce*).

Differently shaped from the only hitherto-known species (*insularis*, Swinh., from Madagascar), more resembling an *Epipristis*; the rows of spots distally to the postmedian line much less complete, less brightly coloured—in *insularis* they are reddish, though Swinhoe calls them "greyish ochreous."

4. *Pingasa lahayeï austrina*, subsp. n.
(Pl. VII. fig. 26.)

Spots beneath rather browner and more extended than in the Palæarctic race (Algeria and Morocco).

Gambia, ♂ (type) and ♀.

5. *Æolochroma prasina spadiceocampa*, subsp. n.
(Pl. VII. fig. 1.)

♂.—42 mm.

Smaller than *prasina prasina*, Warr., from New Guinea and Fergusson Island, both wings with enlarged black discal spot, postmedian line thickened in middle.

Fore wing with median area between costal margin and M^2 mostly of the ground-colour, the reddish line before the subterminal brightened (bay, slightly inclining towards maroon), thickened into a band, running from hind margin to R^2 , then out along R^2 ($-R^3$) to termen.

Hind wing with the reddish subterminal spot between the radials enlarged.

Biak, Schouten Islands, June 1914 (A. C. & F. Pratt).

6. *Dysphania porphyroides*, sp. n.
(Pl. VII. fig. 12.)

♂.—67 mm.

Face light yellowish brown, with a purplish spot in middle. Palpus purplish, first and second joints beneath light brown. Crown mostly purplish. Collar bright yellow. Patagia and tegulæ deep purple. Thorax and abdomen above light brown, slightly mixed with purple, especially near anus; beneath bright yellow.

Fore wing dull purple; some slight cadmium-yellow markings near base—namely, a short irregular line or streak behind SC and some maculation about the fovea; the usual *Dysphania* markings faint, indicated in darker colour; basal streak apparently slight, the succeeding angulated band little interrupted, formed more as in *subrepleta* than in *militaris*; discal spot rather more conspicuous, elongate outward, its distal side tapering; submarginal white spots small, that between SC^5 and R^2 cut by a thick purple line along R^1 , those between R^2 and M^1 more distally placed, the posterior one the smaller, a quite small spot between M^1 and M^2 , the rest obsolete.

Hind wing with termen somewhat waved, not quite regularly rounded, being slightly straighter between SC^2 and R^3 ; dull purple, with the dark markings feeble, formed about as in *subrepleta*, Walk.

Underside with the ground-colour slightly paler, the markings consequently rather more distinct; veins somewhat dusted with yellow; fore wing with subbasal yellow streak better developed; hind wing with a rather broad, rapidly tapering yellow patch at base of costa, a small yellow spot at origin of R^1 , and a sinuous row of small interneural submarginal yellow spots between R^1 and fold, the second, third, and fifth placed nearer to the termen than the first and fourth.

Andaman Islands (*Watkins*).

7. *Agathia curvifiniens*, sp. n.
(Pl. VII. fig. 23.)

Distinguished from *carissima*, Butl., by having the proximal edge of the marginal band of the fore wing strongly sinuous, instead of nearly straight, a strong outward curve being formed between the radials (deepest between R^2 and R^3) and a slighter one between M^2 and SM^2 , the intervening part appreciably curved inward; the subapical green patch is formed, as in many *carissima*, of a large central and small anterior and posterior elements, very finely separated by red-brown dusting on SC^5 and R^2 ; the small submarginal green spot between M^1 and M^2 is almost or altogether obsolete.

Hind wing with a very minute red-brown cell-dot.

Ningpo, type ♂ and paratype ♀. Also from Gensan (Corea) and Kiushiu, in coll. Brit. Mus.

In *carissima* the median band of the fore wing is usually more oblique than in the new species, but varies somewhat.

8. *Anisozygia charma*, sp. n.
(Pl. VII. fig. 9.)

♂.—25 mm.

Face and palpus green above, white beneath. Vertex broadly white; occiput green. Thorax above green, with a large white metathoracic spot, beneath white; pencil beneath base of fore wing white, rather short. Fore leg brown, ringed with white. Hind leg mostly white; tibia without hair-pencil or process. Abdomen largely white, the first tergite broadly green, the succeeding ones narrowly and more faintly, each with a white spot at posterior end.

Fore wing opaque bright green, slightly irrorated with white; costal margin broadly (towards apex narrowly) white with strong red-brown irroration; antemedian line white, very fine or almost obsolete, sinuous; a small white mark on DC^2 ; postmedian line white, almost or altogether broken into a thick oblique mark from beyond two-thirds costa, a thick spot between R^2 and M^1 , almost or quite connected with a larger terminal spot between the same veins, and a large spot on hind margin near tornus; a white subterminal line indicated by a few anterior dots; termen somewhat dotted with white at veins; fringe green, with a white line at base and white spots opposite the veins.

Hind wing with a white dot on DC^2 , the postmedian markings reversed, that on hind margin being small, that on costa large, almost reaching apex; the spot between R^2 and M^1 smaller than on fore wing, more bracket-shaped; mid-terminal spot as on fore wing.

Underside much whiter, with the markings shadowy; fore wing with costal margin nearly as above, narrowly bordered behind by a bright green shade.

Bidi, Sarawak, 1907-08 (*C. J. Brooks*), 4 ♂ ♂.

9. *Spaniocentra isospania*, sp. n.
(Pl. VII. fig. 22.)

♀.—32 mm.

Very similar to the forms of *megaspilaria* ♀ in which the tornal blotch is least darkened (reddish, largely overlaid with lilacine scales). *Hind tibia with terminal spurs only* *.

Fore wing with the dark irroration at base of costa and underlining the white costal edge stronger; tornal blotch narrower and shorter (not crossing R^2 —in paratype not crossing M^1), the narrow purple distal edging, on the other hand, better developed, forming small triangular projections on the veins.

Hind wing with corresponding distinction in the distal edging.

Bombay (*C. H. Druce*). A paratype from the same locality in coll. Brit. Mus.

Except for the difference in the tibial armature I should

* In my indication of this as a normal generic character for "both sexes" I was misled by a wrongly determined *isospania* in the British Museum collection; both in *megaspilaria*, Guen., which belongs here by its ♂ armature, and in its race (?) *pumosa*, Moore, the ♀ has all four spurs.

have regarded this, and not *pannosa*, as the Indian race of *megaspilaria*.

10. *Comibana hemictenes*, sp. n.
(Pl. VII. fig. 21.)

♀.—34–35 mm.

Face green, in middle with an admixture of red, below rather narrowly white. Palpus as in the other African species. Crown green, with a white line in front. Antenna pectinate, the branches very short, about equal in length to the diameter of the shaft. Thorax and abdomen above green, beneath white; the abdomen dorsally with some red irroration, especially at the edges of the large snow-white spots of the third and fourth tergites; a slight red-brown spot on first abdominal. Legs white, more or less spotted (the hind pair very weakly) with reddish brown.

Fore wing bright green, as in *leucospilata*, Walk., etc.; costal edge white, shading off to yellowish; lines fine, white; antemedian from SC at 3.5 mm., slightly excurved to SM², then slightly oblique outward to hind margin; postmedian from SC⁵ at 4 mm. from termen, slightly oblique outward, slightly bent before M¹, then straightish to the proximal edge of tornal blotch at hind margin; cell-dot small, black, red-mixed; terminal line strong, red, extending 1 mm. round apex, interrupted by white dots at the veins, beyond M² gradually expanding into a small tornal blotch; fringe white, with curved or subtriangular red spots, placed so as to connect the terminal line on the outer side of the white dots.

Hind wing without the lines; cell-dot minute; terminal line and fringe as on fore wing, but with a small *apical* blotch corresponding to the tornal of fore wing.

Underside whitish, greener in proximal and costal parts of fore wing, especially subcostally (the costal edge itself white, as above); cell-dots and terminal markings (except the tornal blotch of fore wing) reproduced; fore wing with the two lines faint green, the postmedian crenulate; hind wing with a fine, rather weak, crenulate postmedian green line, about parallel with termen except after M¹, where it runs somewhat obliquely in the direction of the tornus.

Ivory Coast, type and another.

Distinguished from *leucospilata*, Walk., and its race (?) *esmeralda*, Warr., by the pectinate antenna. Of *ruficornus*, Prout (Nov. Zool. xxiii. p. 275), from East Africa, which is, perhaps, still nearer, the ♀ is unknown; but in that species the ground-colour is strongly strigulated with white.

11. *Racheospila penthica*, sp. n.
(Pl. VII. fig. 2.)

♂.—36 mm.

Face blackish. Palpus rather short, blackish, the first and second joints white beneath. Crown dirty green, with a large black spot on each side. Antenna blackish; pectinations scarcely longer than diameter of shaft. Occiput and front of thorax green; thorax and abdomen above otherwise black, beneath dirty white. Fore and (to a less degree) middle leg blackened, with white spots at ends of joints; hind leg white, the tibial process reaching just beyond middle of first tarsal joint.

Fore wing with SC^1 free, R^1 just separate, M^1 widely separate; black, with an interrupted green mark, oblique outward, near base, slight green marks around the large but otherwise scarcely visible black cell-mark; a small, green, black-dotted patch at nearly three-fourths. Costa and a very narrow green distal border, widening slightly at apex and containing at its proximal margin a row of rather large inter-neural black spots; a similar terminal row, extending on to the fringe.

Hind wing with termen slightly subcrenulate, somewhat bent at R^3 ; black, with a small green subbasal mark, and a narrow green distal border, which throws a small projection inward in front of R^2 ; terminal spots as on fore wing.

Fore wing beneath nearly as above, but rather more brownish black and with a narrow blue-white hind-marginal area, which broadens near base so as to touch M . Hind wing beneath blue-white, with a blackish shade between R^2 and costal margin, deepest towards apex, fading out indefinitely proximally.

Huancabamba, Cerro de Pasco, E. Peru, 6800 feet.

Belongs to the *evertata* group (*Blechroma*, Möschl.), and suggests being an aberration of some species of more normal colour-proportions. From the rich district of Huancabamba I know hitherto only three species of the group—*nigricincta*, Warr., *conspersa*, Warr., and *tisstigmata scotocephala*, Prout (Nov. Zool. xxiii. p. 163),—all in single specimens. I have compared it with particular care with all the three, but also with the rest of the group, and cannot make the wing-shape and the position of such markings as remain agree with any. The palpus and tibial process appear slightly shorter than in *nigricincta*, the costa more arched in middle, the submarginal dark spots nearer the termen, etc.; the shape of the hind wing differs from that of *tisstigmata*.

12. *Racheospila inæqualis*, sp. n.
(Pl. VII. fig. 17.)

♂.—30 mm.

Face green, mixed with reddish on outer side. Palpus mostly reddish, with some dark admixture; base beneath whitish. Vertex white, occiput green, a narrow red band between. Antennal pectinations very short, scarcely equal to diameter of shaft. Thorax above green, beneath whitish. Abdomen above greenish, the first segment with a snow-white blackish-edged spot, the third and fourth with elongate, white, slenderly red-edged spots, the later segments with smaller and vaguer spots; beneath white. (Hind legs lost.)

Fore wing with termen strongly oblique, especially in its posterior part; SC¹ anastomosing shortly with C, M¹ separate; bright green; costal edge narrowly snow-white, at base red mixed with black, apically underlined narrowly with red; lines dull red, incomplete; antemedian at one-fourth, marked chiefly by spots on SC and M, and a larger one on SM²—hind margin, the vestiges in cell and at fold angulated outward; postmedian from nearly three-fourths costa to nearly two-thirds hind margin, incurved behind middle, consisting of distinct dashes on the veins and vague deep lunules inward between; cell-dot dull red, not minute; terminal line dull red, slightly interrupted at the veins except posteriorly, where it gradually thickens, reaching a width of nearly 1 mm. near tornus; fringe proximally pure white, with triangular dark red spots, distally with a thick dull red line.

Hind wing with termen feebly sinuate between the radials, slightly bent at R³; M¹ almost connate; concolorous with fore wing, antemedian line represented by a dot on M, the rest (except costally) nearly as on fore wing; a moderate apical blotch reaching R¹.

Fore wing beneath pale green, becoming white at distal margin (narrowly at apex, gradually widening posteriorly); a small reddish cell-dot; fringe nearly as above. Hind wing beneath whitish, with dark apical blotch; fringe nearly as above.

Santo Domingo, Carabaya, S.E. Peru, 6000 feet, November 1904 (*G. Ockenden*).

Presumably referable to my "*Lufayaria* group" (Gen. Ins. fasc. 129, p. 103), but somewhat aberrant in shape.

13. *Racheospila lugentiscripta*, sp. n.
(Pl. VII. fig. 8.)

♂.—28 mm.

Closely allied to *promontoria*, Warr. (Nov. Zool. xi. p. 26), differing as follows:—

Antennal pectinations shorter (rather less than twice diameter of shaft). Abdomen above darker. Size smaller.

Fore wing in addition relatively somewhat shorter, the termen curving so as to become a trifle less oblique anteriorly; ground-colour rather duller green; markings much extended, heavily irrorated (except terminal spots at apex, R^1 , M^2 , and SM^2) with blackish; in particular, the tornal blotch extends along hind margin to 3 or 4 mm. from base, is broadly bounded anteriorly by M from well before origin of M^2 to well beyond M^1 , and is accompanied anteriorly by some smoky clouding which nearly reaches costa and contains the enlarged dark cell-spot.

Hind wing with both blotches broader than in *promontoria*, narrowly connected along termen; cell-dot somewhat enlarged; coloration as on fore wing.

Fore wing beneath very pale green, hind wing almost white; the dark markings reproduced (except the greater part of the tornal blotch of hind wing), less reddish, the paler spots at termen white.

San Antonio, W. Colombia, 5800 feet, December 1907 (*M. G. Palmer*), 2 ♂ ♂.

As subsp. (?) *dubia*, subsp. n., I describe a single ♂ from Intaj, Ecuador (*Buckley*), with the ground-colour a little brighter, the markings rather more red (though much darker than in *promontoria*), on the fore wing formed as in *C. lugentiscripta*, on the hind wing above with the anal blotch extended on abdominal margin to one-third from base, beneath entirely wanting, the ground-colour above reaching the terminal line between R^3 and M^1 .

14. *Phrudocentra senescens*, sp. n.
(Pl. VII. fig. 16.)

♂.—30–31 mm.

Face green. Palpus short, not reaching beyond frons; pale beneath. Vertex and antennal shaft white; pectinations short, scarcely exceeding diameter of shaft. Occiput green. Thorax and abdomen above green, the latter with white dots

at the ends of the segments. Hind tibial process rather longer than the first tarsal joint.

Fore wing moderately broad, apex not produced; duller and more greyish green than the allies; costal edge very narrowly brownish; cell-dot rather large, black; lines weak, represented only by brown-blackish dots on the veins, the postmedian nearer to the cell-dot than to the termen, gently curved anteriorly, then almost straight; no terminal line; fringe paler.

Hind wing with termen scarcely at all bent at R^3 ; cell-dot minute; antemedian wanting; postmedian dots almost parallel with termen.

Underside paler, greenest in central part of fore wing, both wings becoming whitish distally; costal edge of fore wing proximally more broadly brownish than above; both wings with a small discal dot and a very feeble but continuous postmedian line, slightly darker grey-green than the ground-colour.

Sierra del Libane, Colombia, 6000 feet (*H. H. Smith*), 3 ♂♂.

Possibly nearest *niveiceps*, Prout (Gen. Ins. fasc. 129, p. 122), except in shape, which more associates it with *marcida*, Warr. (Nov. Zool. xvi. p. 79), an evident *Phrudocentra*, by lack of ♀ frenulum and general affinity with *pupillata*, Warr.

15. *Oospila circumdata striolata*, subsp. n.
(Pl. VII. fig. 24.)

♂.—Abdomen above much darker than in name-typical *circumdata*, Warr. (Nov. Zool. xiv. p. 202). Both wings with cell-dot slightly enlarged; all the marginal rufous markings somewhat extended, heavily irrorated and striolated with blackish, leaving free only some small spots or patches at the wing-margins.

Rio Ampiyacu, Putumayo, Peruvian Amazons (*J. C. Mounsey*).

In a ♀ from Uodajas, Upper Amazons, April 1907 (*S. M. Klages*), in coll. Tring Mus., the tornal patches do not, as in the Putumayo specimen, cross M^2 , but it is certainly referable to this race.

As the wings appear somewhat narrower than in *c. circumdata*, this may possibly prove a distinct species. The colouring must be nearly that of *quinquemaculata*, Warr. (Proc. U.S. Nat. Mus. xxx. p. 416), from French Guiana,

which I have not seen; but in that species the termen of fore wing is bent in the middle, the tornal spot of fore wing rounded, terminal line interrupted, etc.

16. *Oospila circumscissa*, sp. n.
(Pl. VII. fig. 13.)

♂.—24 mm.

Face reddish. Palpus reddish above, white beneath. Vertex and base of antenna reddish; occiput green. Thorax above green, beneath whitish (abdomen lost). Hind tibia slender.

Fore wing with termen rather more oblique posteriorly than anteriorly; DC³ rather deeply inbent, SC¹ touching C at a point, R¹ not stalked, M¹ well stalked; pale green, with costal edge narrowly reddish; a very minute dark cell-dot; distal border variegated, light red and more purple-red, the latter shade prevailing proximally, its proximal edge olive-brown, commencing at costa close to apex, forming (except for slight indentations at the veins, that at SC⁵ the most noticeable) a fairly regular curve to the middle of M¹, running inward for a short distance along M¹, then approximately vertical (slightly curved) to hind margin; a dark terminal line, interrupted at the veins; fringe reddish, with a yellower line at base.

Hind wing elongate, with strong toothed projection at end of R³; DC scarcely angled at origin of R², M¹ rather long-stalked; concolorous with fore wing, abdominal margin narrowly red nearly to base; cell-dot minute; the red border widening at costa and at abdominal margin, the ground-colour forming a strong projection into it between R³ and M¹; a very narrow yellow-green patch at distal margin between the radials; terminal line thickening, with darkening at the tail; fringe longest and darkest at the tail.

Underside whitish green, with the borders vaguely reddish proximally, only faintly tinged with reddish distally; terminal line obsolescent; fringe of hind wing dark reddish at the tail.

Contamama, Rio Ucayali, Peruvian Amazons, November-December 1912 (*J. C. Mounsey*).

Near *latimargo*, Warr. (Nov. Zool. xi. p. 20), but smaller, and with the border of the fore wing and that of the hind wing posteriorly quite different in shape.

17. *Bathycolpodes torniflorata*, sp. n.
(Pl. VII. fig. 29.)

♂.—33 mm.

Face green above, orange-brown (possibly faded?) below. Palpus reaching beyond face; reddish, with some dark admixture. Antenna simple. Crown whitish, somewhat mixed with green. Thorax above green. Abdomen whitish, dorsally with brown and pink suffusions and some blackish irroration; crests strongly mixed with blackish.

Fore wing dark green; costal edge ochreous, heavily spotted with blackish; cell-dot blackish red; a postmedian row of white vein-dots, incurved between SC^5 and R^3 , then excurved, from M^2 expanding into a tornal blotch, of which the proximal part is white, rounded to SM^2 , here deeply indented, the distal part mostly pinkish with dark irroration, at termen whitish with dark irroration; terminal line thick, blackish red, slightly interrupted at the veins; fringe whitish ochreous, broadly and heavily dark-spotted opposite the veins.

Hind wing with termen very deeply excised between the radials, somewhat prolonged posteriorly to the excision; dark green, with small blackish cell-dot and postmedian white vein-dots, more deeply indented at R^2 than on fore wing; termen and fringe as on fore wing.

Fore wing beneath pale green, at hind margin whitish; costal edge ochreous, with some large blackish dots; cell-dot redder than above; terminal line nearly as above, but expanding into a small blotch at tornus; fringe as above. Hind wing beneath whitish, with dark terminal line expanding into a very small blotch at apex; fringe as above.

Bitji, Ja River, Cameroons, 2000 feet, June–July 1909, dry season (*G. L. Bates*).

18. *Antharmostes simplicimargo*, sp. n.
(Pl. VII. fig. 20.)

♂.—33 mm.

Face and palpus brown-red, the latter whitish beneath. Antennal pectinations little longer than diameter of shaft. Vertex whitish; occiput green. Thorax above green. Abdomen brown-whitish, the vestigial crests dull reddish. Hind tibia not or scarcely dilated.

Fore wing with termen almost straight; green, without markings except the faint indication of a darker green cell-

dot; costal edge and terminal line rosy, coarsely irrorated with blackish fuscous; fringe proximally rosy.

Hind wing with tail shorter than in the other species; as fore wing, except costal edge.

Underside whitish green, the borderings fainter and duller than above.

Udamba, Kuila River, S.W. Congo State (*J. S. Bousfield*).

19. *Thalassodes floccosa*, sp. n.

(Pl. VII. fig. 4.)

♂.—44 mm.

Face green. Palpus with third joint elongate. Vertex and base of antennal shaft white. Thorax and abdomen green; abdomen beneath strongly pilose. Hind tibia densely clothed with long, golden-brown, floccous hair; tarsus not shortened, with similar clothing on the first joint, becoming progressively shorter on the second and third joints.

Fore wing green (faded), with the usual white postmedian line almost straight, placed at about 6 mm. from termen, chiefly marked as dots on the veins; termen with a fine dark line, darker-dotted on the veins; fringe whitish (defective).

Hind wing elongate, with the angle at R^3 well marked; a somewhat raised white cell-mark on DC^3 , nearly as pronounced as in *Eretmopus marinaria*, Guen., more elongate; postmedian line of the normal form, chiefly marked as white vein-dots; termen as on fore wing; beneath clothed to beyond middle with floccous light brown hair.

Prov. Wellesley, Malay Peninsula (*Distant*).

Probably near *leucospilota*, Moore, suggesting an interesting transition towards *Eretmopus marinaria*, Guen.

20. *Prasinocyma rhodocycla*, sp. n.

(Pl. VII. fig. 6.)

♀.—37 mm.

Palpus slightly over twice as long as diameter of shaft, second joint reaching beyond frons, third joint longer than second. Like *oculata*, Prout (Nov. Zool. xxii. p. 316), from Uganda, but with the face reddish, somewhat mixed with green, the wings broader, with rather more rounded termen, the white strigulation less strongly developed, a small white spot beyond middle of hind margin of fore wing. The fringe—green in the proximal part—is greyer and rather paler in the distal.

Ivory Coast.

Has already been mentioned from Kumasi (Coomassie) in the description of *oculata*, but I think it should be regarded as a distinct species—at the least, it will be a West-African race.

21. *Hemithea notospila*, sp. n.
(Pl. VII. fig. 27.)

♂.—36 mm.

Like *subflavida*, Warr., but with third joint of palpus still shorter, abdomen with second and third tergites and their crests red, heavily mixed with black, the crest of the third tergite strong.

Wings with distal margins rather more noticeably waved than in *subflavida*, fringes more strongly chequered; fore wing beneath nearly as in *subflavida reducta*, Warr., but with some slight additional shading subterminally, especially between SC^4 and SC^5 ; hind wing beneath with the terminal dark band well developed from apex to R^2 and again from SM^2 to tornus, shadowy between.

Borneo?

It is unfortunate that the type has not better data; but according to some MS. notes a specimen from North Borneo (? Kina Balu), in coll. Sarawak Mus., which Mr. Moulton showed me some years ago, and which I took to be *subflavida*, Warr., certainly belongs here.

22. *Hemithea antigrapha*, sp. n.
(Pl. VII. fig. 11.)

♂ ♀.—21–26 mm.

Face green. Palpus in ♂ at least one-and-a-half times, in ♀ over twice as long as diameter of eye; third joint in ♂ moderate, in ♀ long; reddish, blackening distally, beneath white. Antennal joints scarcely projecting; ciliation in ♂ somewhat longer than diameter of shaft. Vertex narrowly white; occiput green. Thorax and base of abdomen above green; third and fourth abdominal tergites red, much mixed with black. Hind tibia in ♂ long, moderately dilated, the spurs very unequal, tarsus scarcely one-fourth as long as tibia.

Fore wing dull grey-green; costal edge narrowly ochreous, black-dotted; lines white; antemedian indistinct, slightly interrupted, deeply bent outward in cell, angled inward on M

and SM², outward at fold, oblique outward to hind margin; postmedian strongest as dots on the veins and a dash on hind margin, formed as in the rest of the group (*tritonaria*, Walk., etc.); faint indications of a dark green cell-mark; terminal line blackish, interrupted by conspicuous dirty white dots at the veins; fringe dark grey, paler distally, and with a fine pale line at its base.

Hind wing rather long and narrow, with the tail at R⁸ rather well developed; as fore wing, but without costal markings or first line, the cell-mark rather more noticeable.

Fore wing beneath whitish green; costal edge as above, but more weakly dotted; terminal line blackish, interrupted at the veins; a small grey spot at tornus; fringe dark grey, pale at base. Hind wing beneath whitish, with a dark grey blotch between apex and R¹, darkest in its anterior half; termen and fringe as on fore wing.

Khasis, in various collections. Also from Penang and Mount Tahan, Malay Peninsula, in coll. Tring Mus.

Darker than *tritonaria*, Walk.; further distinguished by the greener face (in *tritonaria* nondescript olivaceous to reddish), more black-mixed patch on the abdomen, presence of dark blotches on the wings beneath, and structurally by the longer palpus.

23. *Hemithea distinctaria lata*, subsp. n.

(Pl. VII. fig. 18.)

♂ ♀.—Abdomen almost entirely without the rosy and black dorsal ornamentation of segments 2-4. Wings brighter green, the colour resembling that of *nigropunctata*, Warr.

Khasis.

The costal edge of the fore wing is not or scarcely dotted with fuscous, but this is also sometimes the case with *d. distinctaria*.

24. *Neromia enotes*, sp. n.

(Pl. VII. fig. 15.)

♂.—23 mm.

Face deep red, heavily mixed, except at edges, with black. Palpus minute, dull reddish. Tongue vestigial. Antenna dentate, with short ciliation. Crown green, mixed with ochreous. Thorax above green, narrowly orange-ochreous in front. Abdomen whitish ochreous, whiter beneath. Fore coxa deep red in front; fore and middle femora and tibiae partly reddish.

Fore wing rather short and broad; very pale green, the costal edge pale ochreous, more broadly at base; antemedian line wanting; postmedian slender, ochreous white, from hind margin at about three-fourths, obsolescent from R^1 forward; terminal line and fringe whiter.

Hind wing with abdominal margin relatively long, termen strongly rounded in posterior part; line of fore wing continued, farther from termen, weak at abdominal margin.

Fore wing beneath nearly as above, the line weaker; hind wing somewhat whiter, the line weakly indicated.

Gambia (*A. Moloney*).

Closely similar to *N. carnifrons*, Butl., the only non-African species of the genus.

25. *Neurotoca insolens*, sp. n.

(Pl. VII. fig. 19.)

♂.—33 mm.

Face red. Palpus extremely minute, red. A short tongue present. Vertex and proximal part of antennal shaft red; occiput green. Antennal pectinations about twice as long as diameter of shaft. Thorax above green; abdomen dirty whitish ochreous, with dark belts (possibly discoloured), crests slight. Underside whitish. Fore leg marked with red on upper and inner side.

Fore wing less pointed than in the typical species; M^1 connate; green, as in *Heterorachis simplex*, Warr. (*haploa*, Prout); costal margin red at base; cell-mark faintly darker green; fringe white.

Hind wing more rounded than in the typical species; C anastomosing with SC at a point near the base, then diverging, M^1 shortly stalked; as fore wing, except costal margin.

Underside almost uniform whitish green; fore wing with costal margin ochreous, at base reddish, the costal and apical regions slightly greener than the rest of the wing.

Victoria Falls, Rhodesia (*E. H. Druce*), type and another.

Placed provisionally in *Neurotoca*, as it would fall there by my keys (Gen. Ins. fasc. 129, p. 14; Nov. Zool. xx. p. 434), but probably requiring a new genus. There can be little doubt it is a direct development of *Heterorachis*, with the median spurs of the hind tibia wanting.

26. *Prohydata ignita*, sp. n.

(Pl. VII. fig. 10.)

♀.—23 mm.

Face white, with a tinge of yellow, the upper part light

red. Palpus nearly three times as long as diameter of eye ; white, the first and second joints shaded with red on outer side. Vertex white, occiput green, a slight red line between. Antenna thick, lamellate, the scaled surface white. Thorax and abdomen above green, brighter than on the wings.

Fore wing with a light red, yellow-mixed costal area, broadening from base to beyond cell, where it reaches R^2 , then narrowing to a point at apex ; the rest of the wing pale olivaceous, mostly translucent behind the cell and R^3 from base to postmedian line, otherwise darkened with slaty grey, only becoming pale green at extreme termen and on fringe ; lines dark grey, rather thick but only defined on the red costal patch, where the postmedian is accompanied distally by some yellow spots ; a long-oval yellow spot near apex ; an ill-defined oblique blackish dash from apex, deepest on fringe ; some ill-defined slaty-grey patches on hind margin in the translucent area, the most prominent enclosing a pale space.

Hind wing strongly angled at R^1 ; C approximated to SC for a short distance near base, including anastomosis at a point only ; nearly all grey, the basal and distal areas more brownish, the median more slaty ; cell-mark and curved (near abdominal margin sinuate inward) postmedian line indicated in darker grey ; a green spot on abdominal margin proximal to median area and slighter green shades distally on the same margin ; distal margin very narrowly green ; fringe green.

Underside paler greenish, similarly but more vaguely marked.

Cachi, Costa Rica.

In spite of the great differences it is conceivable that this may be a ♀ form of *busa*, Druce (Biol. Centr.-Amer., Lep. Het. ii. p. 92), of which the unique type (from Chiriqué, Panama) is a ♂ in Coll. Staudinger and unknown to me. That there is sometimes strong sexual dimorphism in this genus is shown by *latifasciata*, Warr., and others, in which the ♀ has complete and broad distal border to the fore wing, while that of the ♂ is broken.

27. *Berta chrysolineata philippina*, subsp. n.
(Pl. VII. fig. 14.)

♂.—22 mm.

Smaller and greener than the name-type, the white markings narrowed ; particularly noticeable is the slender but almost uninterrupted postmedian line of the fore wing.

Palawan (*Doherty*), 2 ♂♂ in Coll. Joicey, another in Coll. Tring Mus.

Subfam. *GEOMETRINÆ*.28. *Macaria laguatia*, sp. n.
(Pl. VII. fig. 3.)

. ♀.—33–35 mm.

Frontal tuft very small. Palpus one-and-a-half times as long as diameter of eye. Head and body concolorous with wings.

Fore wing with termen waved, a scarcely noticeable sinus between R^1 and R^3 ; SC^1 arising from C; SC^2 free; white, shaded almost throughout with violaceous fuscous and with some coarse dark fuscous irroration; an ill-defined ochreous-brown admixture in the region of the lines, especially post-medially; costal margin indefinitely dark-spotted basally; lines thick and strongly oblique outward at costa (at approximately one-fifth, two-fifths, and three-fifths), otherwise ill-defined and oblique inward, the antemedian inbent behind M, the median forming a sinuous shade in the region of the somewhat elongate, obliquely placed, dark cell-mark, the postmedian forming a marked inward curve between R^1 and M^2 , accentuated by a long blackish mark on its proximal side, which is swollen in the middle and gradually tapers posteriorly; the blackish marks between the radials beyond the postmedian line (characteristic of many of the genus) unusually elongate—nearly or quite 2 mm. in length; a large dark ferruginous spot from nearly four-fifths costa almost to the subcostal angle of postmedian line; an oblique darker mark from tornus to fold; the space between median shade and postmedian, a small patch distal to the ferruginous one, and another at mid-termen mainly whitish, the second of these patches usually culminating in a clearer white spot between SC^5 and R^1 ; termen with shallow elongate dark lunules, which are sometimes almost confluent; a slight interrupted white line at base of fringe, extending minutely on to the wing distally to the lunules; fringe otherwise violet-fuscous, quite weakly dark-spotted opposite the veins.

Hind wing with median shade curving inward proximally to the cell-spot, which is rounder (less elongate) than on fore wing; distal area more weakly marked than on fore wing, wanting the characteristic dark markings.

Both wings beneath purer white, though with coarse strigulate irroration; costal edge and veins more or less strongly ochreous; cell-marks strong; median shade present, but ill-defined; area distally to postmedian line dark, ferruginous-mixed, enclosing on the fore wing white patches corresponding

to the whitish ones of upper surface and on the hind wing a triangular white patch from tornus about to R^3 and some ill-defined white apical shading; termen as above; the white at base of fringe broader on posterior half of fore wing and most of hind wing, the dark spots at vein-ends strengthened.

Ivory Coast, type and another; Coomassie, 3 ♀ ♀ in Coll. Brit. Mus.

Characterized by the strongly incurved postmedian line and the length of the dark marks distally to it.

29. *Milionia anisochrysa*, sp. n.
(Pl. VII. fig. 7.)

♀.—46 mm.

Face black. Palpus short, blackish. Vertex blackish brown; occiput black. Collar, front of thorax, and fore coxa yellowish white. Thorax and abdomen above black, the latter with some yellow scales at the ends of the segments; sides of abdomen bright yellow, venter much paler and duller.

Fore wing rather long and narrow; SC^{1-2} coincident, free; black, with a transverse oblique white patch of 1–2 mm. width from SC^{3-5} (and basal part of SC^5 after its separation) to M^2 , constricted in middle, its proximal edge being nearly straight, its distal projecting at R^1 , sinuate inward between this and R^3 .

Hind wing rather elongate; black, with a few yellow scales in places and a small patch of the same colour between R^1 and M^1 , about halfway between cell and termen.

Fore wing beneath as above, the white band slightly widened. Hind wing beneath yellow, with a black border and an interrupted black band joining the border at costa and towards tornus, just entering the anterior corner of the cell, suddenly narrowed at cell-fold by a projection of the proximal ground-colour, widening again gradually from M^1 ; the distal black border is rather broad on apical region, with slight indentations of the ground-colour, narrower (scarcely 2 mm.) from R^3 to behind M^1 .

Biak, Schouten Islands, June 1914 (A. C. and F. Pratt).

The upper surface rather recalls *bicolorata*, Warr. (Nov. Zool. iii. p. 398), but the under shows affinity with *tricolor*, Warr. (Nov. Zool. iii. p. 130). I cannot see that the group (*Pseudeusemia*, Weym., in Lep. Niepelt. i. p. 10) is separable structurally from *Milionia*.

EXPLANATION OF PLATE VII.

- Fig. 1. *Æolochroma prasina spadococampa*, ♂, p. 111.
 Fig. 2. *Racheospila penthica*, ♂, p. 115.
 Fig. 3. *Macaria laguatia*, ♀, p. 126.
 Fig. 4. *Thalassodes floccosa*, ♂, p. 121.
 Fig. 5. *Phellinodes biapicata*, ♂, p. 108.
 Fig. 6. *Prasinocyma rhodocycla*, ♀, p. 121.
 Fig. 7. *Milionia anisochrysa*, ♀, p. 127.
 Fig. 8. *Racheospila lugentiscripta*, ♂, p. 117.
 Fig. 9. *Anisozyga charma*, ♂, p. 112.
 Fig. 10. *Prohydata ignita*, ♀, p. 124.
 Fig. 11. *Hemithea antigrapha*, ♂, p. 122.
 Fig. 12. *Dysphania porphyroides*, ♂, p. 111.
 Fig. 13. *Oospila circumssessa*, ♂, p. 119.
 Fig. 14. *Berta chrysolineata philippina*, ♂, p. 125.
 Fig. 15. *Neromia enotes*, ♂, p. 123.
 Fig. 16. *Phrudocentra senescens*, ♂, p. 117.
 Fig. 17. *Racheospila inæqualis*, ♂, p. 116.
 Fig. 18. *Hemithea distinctaria læta*, ♂, p. 123.
 Fig. 19. *Neurotoca insolens*, ♂, p. 124.
 Fig. 20. *Antharmostes simplicimargo*, ♂, p. 120.
 Fig. 21. *Comibana hemictenes*, ♀, p. 114.
 Fig. 22. *Spaniocentra isospania*, ♀, p. 113.
 Fig. 23. *Agathia curvifiniens*, ♂, p. 112.
 Fig. 24. *Oospila circumdata striolata*, ♂, p. 118.
 Fig. 25. *Mimandria cataractæ*, ♂, p. 110.
 Fig. 26. *Pingasa lahayeae austrina*, ♂, p. 111.
 Fig. 27. *Hemithea notospila*, ♂, p. 122.
 Fig. 28. *Phellinodes leucoplethes*, ♂, p. 109.
 Fig. 29. *Bathycalpodes torniflorata*, ♂, p. 120.

IX.—A new Genus of Ursidæ.

By R. I. Pocock, F.R.S.

IN 1914 (P.Z.S. p. 940) I pointed out that mainly by the structure of the feet the existing species of bears might be referred to the following genera:—*Thalarctos*, *Ursus*, *Tremarctos*, *Helarctos*, and *Melursus*. On the evidence supplied by the feet, two species were assigned to *Tremarctos*—namely, *ornatus*, the type of the genus, from the Andes of South America and *thibetanus* from Central Asia. The latter has been previously and universally referred to the genus *Ursus*, and was the only well-marked species of the family to escape the gift of a special generic or subgeneric title.

Subsequent comparison between the skulls of the two species in question convinces me that they cannot consistently be ascribed to the same genus. I propose, there-

fore, to sever *thibetanus* from *Tremarctos*, and to name and define it as follows :—

Genus ARCTICONUS *, nov.

Type, *Ursus thibetanus*, Cuv.

Fore foot with digital pads separated almost to their proximal extremities and capable of wide divarication ; digital pad of the pollex set far back, behind that of the second digit. Area between the digital pads and plantar pad overgrown with hair, except behind the pads of the pollex and fifth digit. Carpal pad as wide as the plantar pad and elongately piriform, being broad externally and narrowed towards the inner, or pollical, side of the foot, where it touches the plantar pad. Elsewhere the carpal pad is separated from the plantar pad by a depressed hairless area of grooved and thickened skin. The wrist above the carpal pad is thickly hairy.

Hind foot resembling the fore foot in the separation of the digital pads, and the hairiness of the area between them and the plantar pad ; digital pad of the first and fifth digits set behind those of the second and fourth, so that the series is strongly curved. Plantar pad forming a continuous shield with only a feebly-marked depression, devoid of hairs, on the inner or hallucal margin.

Ears large. *Rhinarium* normal ; upper lip hairy, except for a narrow naked strip of skin extending from the rhinarium in the middle line.

The only species of bears which combine in their fore feet free digital pads with an immense carpal pad as wide as the plantar pad, and merely defined from it by a groove of naked skin, are *Helarctos malayanus* and *Tremarctos ornatus* and their allies. Apart from the characters supplied by the subrhinarial tract of the upper lip and the ears, *Helarctos* may be distinguished by the shortness of the skull in front of the post-orbital processes, involving reduction in length of the post-canine space, suppression of one of the anterior upper premolars, and other features requiring analysis with considerable material. *Tremarctos* also has a very short skull, much shorter than in *Arcticonus thibetanus*. In one point at least it differs from the skull of all other bears. In the mandible the hollow of the coronoid process is defined below by a strong ridge passing downwards and backwards

* ἄρκτος, a bear, εἰκὼν, -ονος, an image. Hence the second syllable of the generic name is long, and the third short.

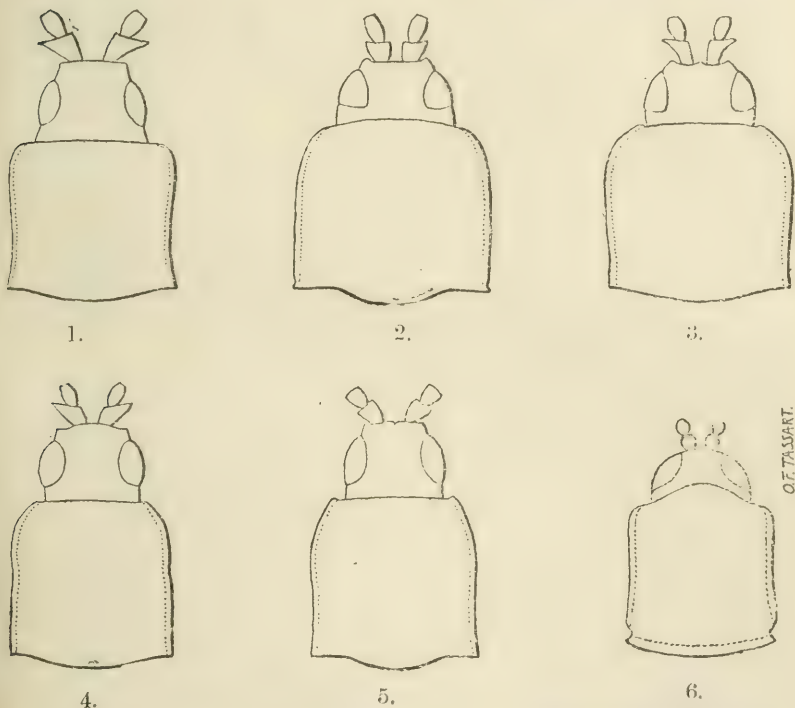
from a point just behind the last molar towards the inferior edge some distance in advance of the angular process. Below and in front of this ridge there is another large depression. In all other bears the hollow of the coronoid is bounded inferiorly by a crest running horizontally forwards from the angular and curving upwards on a level with, or in front of, the anterior edge of the root of the coronoid process, and the adjoining surface of the mandibular ramus has no depression. Perhaps in *Tremarctos* the depression of the coronoid (masseteric fossa) may be described as very large and completely divided by a bony ridge into an upper and a lower portion by the above-mentioned crest of bone, but the musculature of this region requires, I believe, working out.

X.—*Note on the Subgenus Paradownesia, Gestro.*

By S. MAULIK, B.A. (Cantab.), F.E.S.

IN the 'Annali del Museo Civico di Storia Naturale di Genova' (serie 2a, vol. xx. (xl.), 3 Nov., 1899, p. 220), Dr. Gestro has published a note on the genus *Downesia*, founding *Paradownesia* as a subgenus of it. The characters on which he establishes the subgenus are stated as follows:—“(1) Una *facies* molto diversa, dipendente della forma più allungata e più stretta; (2) dagli elitri convessi, più stretti all'apice che alla base, non più larghi del protorace e con scultura leggera; (3) Il capo è troncato in avanti e si avvanza alquanto al di là degli occhi con una sporgenza larga rettangolare che in parte copre il primo articolo delle antenne.” Then Dr. Gestro goes on to remark that this conformation of the head is not found in any species of true *Downesia*, including, of course, the type. I agree with him that *D. longipennis*, Gestro (the type of *Paradownesia*) and other forms which he has described under it ought to be separated from *Downesia*, with which they have no affinity. But I see no reason why they should form a subgenus of *Downesia* at all. Judging from the figure and description of *D. longipennis* (Ann. Mus. Civ. Stor. Nat. Genova, vol. x. (xxx.), Nov. 1890, p. 244, and Nov. 1899, p. 220), and examining *Paradownesia fruhstorferi*, Gestro, of which a cotype exists in the British Museum, and also another specimen which bears a label in Dr. Gestro's handwriting, determining it generically as *Paradownesia*, I am of opinion that this subgenus should be a synonym of *Leptispa*. My first reason is that the characters that Dr. Gestro selects for erecting *Paradownesia* are found in

Leptispa. To illustrate this, I add figures of the heads of *Leptispa filiformis*, Germar (type of the genus), *L. natalensis*, Baly, *L. pygmæa*, Baly, and *L. godwini*, Baly. Comparing these figures with that of *D. longipennis*, there can be no doubt that the characters of *Paradownesia* are identical with those of *Leptispa*. In *L. natalensis* it will be noticed that the truncate nature of the front of the head and the



1. *Paradownesia longipennis*, Gestro.
2. *Leptispa godwini*, Baly.
3. *L. pygmæa*, Baly.

4. *Leptispa natalensis*, Baly.
5. *L. filiformis*, Germar.
6. *Downesia insignis*, Baly.

pointedness of the apex of the first joint of the antennæ are accentuated. Dr. Gestro has laid stress on these two characters. A figure of the head and prothorax of *Downeria insignis*, Baly (type of the genus), is also given to show the difference, viz., the entire absence of these important characters. My second reason is that the forms of *Paradownesia* I have had occasion to examine possess a short scutellar row of punctures. This is an important

character, because it is quite constant and is not found in the groups *Cœlænomenerini*, *Promecothecini*, *Exothispini*, and *Gonophorini*; therefore, *Paradownesia* cannot come under *Gonophorini* at all. I mention one or two more characters to add weight to my conclusion: (1) Each elytron of the species of *Downesia* generally has eight to ten rows of punctures, and they run parallel right up to the apex; in *Paradownesia* there are more than ten rows, and they converge towards the apex and meet in pairs. (2) In *Leptispa* towards the apex, the margins of the elytra have become gently reflexed, a character which is also found in *Paradownesia*.

Of the eighteen species of *Leptispa*, Dr. Gestro has described only two. This may show that he has not had the occasion to examine many *Leptispas*, otherwise, I am sure, this note would not have been necessary.

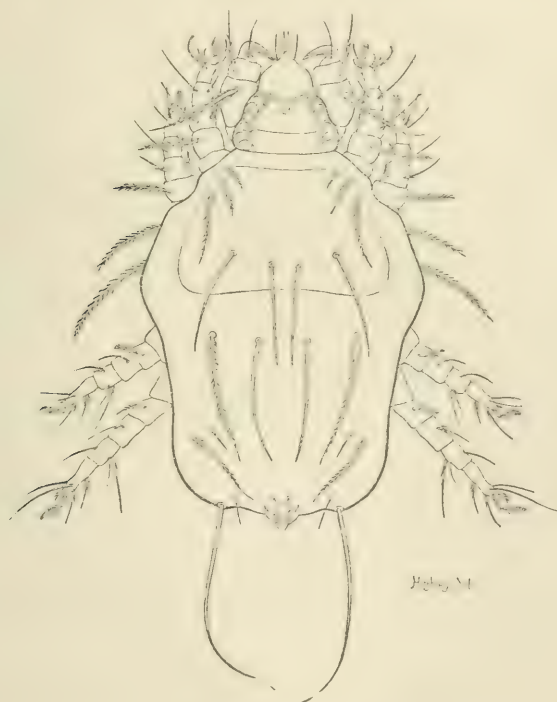
Examining the cotype of *Paradownesia fruhstorferi*, Gestro, and the type of *Letispa godwini*, Baly, I find that they are the same species. *P. fruhstorferi* becomes a synonym of *L. godwini*. The former has been taken at Tonkin, and the latter at Shanghai.

XI.—On the Occurrence of a *Pseudoparasitic Mite* (*Cheletiella parasitivorax*, Mégnin) on the Domestic Cat. By STANLEY HIRST.

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THE mite dealt with in this short note normally lives in the fur of the rabbit and hare, and is said to feed on the minute Acari (*Listrophorus*, etc.) found on these rodents. Whilst examining a freshly-killed cat affected with mange, I found numerous specimens of *Cheletiella parasitivorax* on various parts of the body. A few isolated eggs, each fixed to a hair, were also discovered; they were elongated, resembling the egg of a louse in general appearance, but minute, and with a very delicate cuticle. Presumably in this case the *Cheletiella* fed on the Acarus (*Notodrus cati*) which is the cause of the mange, but all the examples of the pseudoparasite were found on the body, whereas only the ears and face were affected by the mange. As this pseudoparasite has not previously been found on the cat, I think its occurrence on that host worthy of record. The mangy cat on which the specimens were discovered was given me by the Superintendent of the Fulham Cat Shelter, and was not known to have come in contact with rabbits. Five other London cats were examined, but the *Cheletiella* did not occur on them.

In the genus *Cheletiella* the palp is stout, ending in a short prehensile claw, which is used to grasp the hairs or feathers of the host. Several species of *Cheletiella* have been found on birds or in their nests, but apparently *C. parasitivorax* is the only one that lives on mammals; it can be readily distinguished from the other species of the genus by the absence of the claws, which have entirely disappeared. Perhaps the best figure of *C. parasitivorax* is Canestrini's (Prosp. Acarof. ii. pl. xi. fig. 3), but it is not quite accurate in all the details; for instance, the scutum is not shown,



Dorsal view of *Cheletiella parasitivorax*, Ménéin.

and one of the pairs of short plumose hairs at the anterior end of the body is also omitted; moreover, the hairs of the outer pair in the middle of the body are depicted as being plain instead of plumose. Specimens of the *Cheletiella* from the cat have been carefully compared with others from rabbits, and apparently there is no structural difference between them. The new figure accompanying the present note has been carefully drawn by Mr. Percy Highley with the aid of a camera lucida.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

March 14th, 1917.—Dr. A. Smith Woodward, F.R.S.,
Vice-President, in the Chair.

The following communication was read:—

‘The Carboniferous Limestone bordering the Leicestershire Coalfield.’ By Leonard Miles Parsons, D.I.C., B.Sc., F.G.S.

The inliers of Carboniferous Limestone situated along the northern border of the Leicestershire Coalfield crop out in two well-defined series:—a Western series composed of almost horizontal beds exposed by stream-erosion, and an Eastern series in which the limestone is highly inclined and complicated by faulting. The thinly-bedded limestones, shales, and dolomites of the Western inliers are of a slightly-higher horizon than that of the uppermost beds of the more massive dolomites seen at Breedon and Breedon Cloud farther eastwards. In no part of the district is the base of the Carboniferous seen, although borings have shown that the limestone rests upon pre-Cambrian rocks in the neighbourhood of Charnwood Forest.

The dolomites of the area yield evidence of two distinct periods of dolomitization—one pre-Triassic, the other subsequent to the Trias. During the former period the bulk of the rock was dolomitized.

The fauna of the limestones and dolomites indicates the presence of palaeontological horizons ranging from D_1 to D_2 – D_3 inclusive. The D_1 portion of the sequence, consisting of thickly-bedded dolomites without chert, contains a fauna similar to that of the Caldon-Low facies of the south-western part of the Main Midland Province, the rare species *Productus humerosus* being found at Breedon and Breedon Cloud.

Unlike the rocks of the D_1 subzone of Derbyshire, the corresponding beds in Leicestershire contain no igneous rocks equivalent to the ‘Toadstones.’ Higher dolomites with chert, equivalent to the cherty limestones of Derbyshire, yield a D_2 fauna, which somewhat resembles that of the localized development of the *Lonsdaleia* Subzone in the south-western part of the Midland area, in the region of Waterhouses.

A typical D_3 development is not present in Leicestershire, although the upper barren dolomites of Ticknall may represent part of the *Cyathaxonia* Subzone of other districts.

The Pendleside Beds are poorly represented by about 30 feet of blue shales, which are succeeded conformably by the Millstone Grit.

April 18th, 1917.—Dr. Alfred Harker, F.R.S., President,
in the Chair.

The following communication was read:—

‘The Development and Morphology of the Ammonite Septum.’
By Prof. Henry Hurd Swinnerton, D.Sc., F.G.S., and Arthur
Elijah Trueman, M.Sc.

Two methods of studying the septum (not merely the suture)
were used:—

- (1) Cleaning the face of the septum completely.
- (2) Filing away the surface of the whorl in successive layers, and thus making a series of sections—called septal sections—of the septum parallel to its periphery.

An instrument was designed for measuring accurately the variations in level of the face of the septum in relation to a definite datum-plane; and also the thickness of the layers filed off from the whorl.

Dactylioceras commune, *Sphæroceras brongniarti*, and *Tragophylloceras loscombi* were chosen as types with normally shaped, greatly depressed, and greatly elevated whorls respectively.

A contoured plan, of the adult septum of *Dactylioceras*, shows that half the septum lies approximately in one plane; and that the posterior folds or lobes occupy a greater area than the anterior folds or saddles. It also confirms the view that the septum is, on the whole, convex forwards. In all three types the axes of the folds remain approximately at right angles to the periphery through all the changes in shape of the whorl. Incompletely formed septa indicate that secretion commences at the umbilical angle and at a definite distance from the preceding septum.

The examination of adult sutures of various species of *Dactylioceras* shows that the major frillings alone are of systematic importance for that genus. The variations in the minor frillings, and in the suture-line as a whole, throw light on the changes which accompany senile decline.

The second septum is remarkably like the central portion of the adult septum; but the flattened portion is relatively less extensive, the folds are sharper, and the whole septum tends to be concave rather than convex. As development advances the successive septa possess a similar resemblance to an increasing area of the adult septum. The outcome of this is, that a series of septal sections of the adult septum closely resembles the developmental series of the suture-line. The same is true also for *Sphæroceras* and *Tragophylloceras*.

In no case do the septal sections show a stage comparable with the first suture-line. In *Tragophylloceras* the similarity starts not later than the seventh septum. With these exceptions, septal sections reproduce the main features in the development of the sutures with sufficient accuracy to justify their use for the same purpose, especially when the material for the study of the early stages is inaccessible.

It is possible that septal sections may also furnish the clue to the probable lines along which simplification of the suture proceeds in the retrogressive members of any stock.

Asymmetry of the septum, and of the suture-line, in ammonites is more common than is usually supposed. It may arise in one of two ways, namely:—

- (1) By the different development of the elements of opposite sides.
- (2) In association with the lateral displacement of the siphuncle.

Asymmetry of the latter type has been considered as of systematic importance. Nevertheless, while it does arise more frequently in certain genera, as, for instance, in *Psiloceras* and *Hoplites*, it occurs not uncommonly in many other unkeeled ammonites.

May 2nd, 1917.—Dr. Alfred Harker, F.R.S., President,
in the Chair.

The following communication was read:—

1. 'Supplementary Notes on *Aclisina* De Koninck, and *Aclisoides* Donald, with Descriptions of New Species.' By Jane Longstaff (*née* Donald), F.L.S.

Since the publication of a paper by the Geological Society on *Aclisina* in 1898, a much larger amount of material has come to hand, which has not only added to the knowledge of the species there described, but has also led to the discovery of six others new to science. The diagnoses of these are now given, and a species named by Mr. H. Bolton *Toxonema ashtonensis* is referred to this genus, as several specimens show the characteristic lines of growth.

The total number of species of *Aclisina* is now brought up to twenty-two, and there are besides several varieties. The genus is best represented in Scotland, where the specimens are generally remarkably well preserved, no less than thirteen having the protoconch intact, drawings of which show its somewhat irregular character. A table is appended giving—so far as known—the range and localities in the British Isles and Belgium. A small variety of *Aclisina pulchra* De Koninck appears to have continued for the greatest length of time, commencing in the Calciferous Sandstone Series, existing throughout the Lower and Upper Limestone Series and on into the Millstone Grit of Scotland.

Additional observations are also made on *Aclisoides striatula* (De Koninck), showing its variation in size and ornamentation, as well as its range throughout the Lower and Upper Carboniferous Series of Scotland, its occurrence at Settle and Poolvash, and at Tournai as well as Visé. New drawings are given of De Koninck's type-forms. One of these, as also a Scottish example, has the characteristic sinus preserved. The holotypes of the first described species were not originally selected: that omission is now rectified, with references to the collections in which they are deposited.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 116. AUGUST 1917.

XII.—*A Systematic Revision of the African Species of the Coleopterous Family Erotylidæ.* By GILBERT J. ARROW.

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HAVING been asked by Professor Thaxter, of Harvard, to determine for him several species of African Erotylidæ upon which he has discovered parasitic growths of Laboulbeniaceæ, two of the hosts being here described as new species, it has become necessary to look closely into the comparative characters of the recognized genera. This has revealed a state of confusion in the nomenclature which, so long as it remains, renders the description of additional species a positive disservice to systematic entomology, as increasing the difficulties of those who come after. In naming these new forms I have therefore felt myself under the obligation of attempting to bring into some better order the genera concerned. The recent work upon the group contributed by Kuhn to Wytsman's 'Genera Insectorum' fails in any way to dissipate the prevailing confusion. In his tables of genera sections are actually made to which no characters of any kind are assigned, the supposed geographical range of the genera being substituted. It is evident that the materials upon which the work is based were altogether inadequate for the purpose; but it is difficult to understand what value exists in compilations produced under such conditions.

Kuhn has catalogued seventy-four African species under fifteen generic names; but seven of the latter names prove

superfluous, and a critical examination shows that a considerable number of the specific names are synonyms. At the end of this paper I have given a revised list of the African species, distributed, so far as available materials permit (and I have fortunately been able to determine the large majority of described species), under their correct generic names. A number of hitherto unknown species are added. The genera will no doubt be increased as our knowledge of the species grows : but the latter are not numerous, so far as at present recorded, and the creation of new genera, in the present unsatisfactory state of classification of the family, appears very undesirable.

Either by oversight or intention the genus *Euxestus* has been omitted by Kuhnt both from the 'Genera' and his since-published Catalogue, although allied genera like *Hypodacne* and *Eidoreus* are included. The African species of *Euxestus* here described forms an interesting link with *Hypodacne* and helps to render the position of the former genus less enigmatical. This is the second species known to me, all the non-African specimens I have seen, although bearing many names, being conspecific. *Euxestus parki*, Woll., was first discovered in Madeira ; but I have seen specimens from China, Burma, the Malay Peninsula, Philippine Is., Java, Hawaiian Is., Haiti, Central America, etc. *E. minor*, Sharp, and *E. piciceps*, Gorh., are certainly identical with it (see Champion, Trans. Ent. Soc. Lond. 1913, p. 79) ; and *Neoplotera peregrina*, Belon, and *Tritomidea translucida*, Motsch., I believe to be also synonymous both as genera and species. It is not possible to decide whether Motschulsky's names *basalis* and *oblonga* also belong to the same insect ; but the *Tritomidea rubripes* of Reitter, although related, is not congeneric, and the two Malayan species referred to *Tritomidea* by Gorham have evidently neither affinity nor resemblance to it.

M. Bedel has recently formed a new genus, *Mimodacne*, for certain species previously included in *Megalodacne* but in which the club of the antenna is very large and markedly asymmetrical. The genus is a little difficult to define, as the shape of the club is gradually developed through a series of transitions : but it may be convenient to retain it for those species which exhibit the most pronounced asymmetry. One of these, *M. magnifica*, Har., has been transferred to *Lindesmus* by Kuhnt, in spite of the fact that Harold stated its resemblance to *L. cactus* to be purely superficial. It has also been redescribed by Kuhnt as *Megalodacne kollei*.

I have found myself, like Harold (Coleopt. Hefte, xvi.

1879, p. 219), unable to discover any feature of generic value by which it is possible to distinguish Crotch's genera *Megalodacne* and *Episcaphula*, and I therefore regard the latter, which is of later date, as a synonym of the former. All the African species retained in *Episcapha* in Kuhn's Catalogue have an elongate third joint to the antenna, and must therefore be referred to *Megalodacne*.

The sexes of many species of this genus are strongly differentiated by the curvature of the tibiae and the dilatation of the tarsi in the male. *Episcaphula dubia*, Crotch, is the female of *E. aulacochiloides*, Crotch, the punctured prosternum noticed in the latter by Crotch being also a male character.

Episcapha schweitzeri, Dohrn, is synonymous with *Megalodacne obliquata*, Lacord.; *E. rectesignata*, Crotch, is a barely distinguishable form of it; and *E. neutra*, Dohrn, is evidently very closely related. *Megalodacne scenica*, Gerst., has also been redescribed as *Episcaphula picturata*, Gorh. The species described by Lacordaire as *Episcapha repanda* is probably not the true *M. repanda*, but the one later named *E. piciventris* by Gorham. *Episcaphula subcostata*, Schenk., appears to belong to the genus *Plagiopisthen*, which is best retained for the present as a separate genus, on account of its distinctive shape. *Platydacne* is a synonym of it.

The paper by Gorham describing Erotylidæ from South and West Africa (Ann. & Mag. Nat. Hist. (7) v. 1900) is so astonishing an example of confused nomenclature, and has resulted in complicating the synonymy of the genera concerned to such a degree, that the mind rather recoils from the Augean task of clearing the ground. Gorham's genera are usually exceedingly unsatisfactory, and his own conception of them is often geographical rather than morphological, as shown by such remarks as "Had this species been an African insect, I should have referred it to my genus *Amblyscelis*" (l. c. p. 90) and "I have taken an African insect for the type of *Amblyscelis*, otherwise I should have regarded this species and *A. nigrinus* as belonging to my genus *Petaloscelis*" (l. c. p. 89). It is evident from these passages that the genus *Amblyscelis* was a shadowy one, even in the mind of its author. Gorham has not, as a matter of fact, cited its type at all, but states that it is formed for the African species placed in *Amblyopus* by Lacordaire and Crotch. Of these he mentions only *A. senegalensis*, Lacord., which may therefore be considered the type of *Amblyscelis*. This species I do not know, but it possesses the very large and coarsely-faceted eyes and the narrow, loosely-jointed

antennal club characteristic of *Amblyopus*, whilst others associated with it by Gorham have small, finely faceted eyes and very short, broad, and closely articulated club-joints, as in *Petaloscelis*. It is true that they all agree in inhabiting Africa, but, in spite of that, their structural diversity precludes their association in a single genus.

The type of *Petaloscelis* is a Burmese insect, *P. instabilis*, Gorh. Kuhn has joined with it a very different species, *Erotylus rubens*, Hope, although I had already stated that to be a *Neotriplax*. With *P. instabilis* "*Amblyscelis*" *pallidus* and *hæmorrhous* of Gorham may be associated, and *A. kelleni* and *brunneus*, Gorh. (and perhaps *A. gorhami*, Gestro), are synonyms of the last. Another species is "*Zythonia*" *anthracina*, Gorh., incomprehensibly referred to a genus to which it has no resemblance. Equally mysterious is Gorham's simultaneous redescription of the true *Zythonia* (*Z. fulva*, Westw.), a striking and unmistakable insect, as *Lophocrotaphus guineensis*.

To the genus *Amblyopus* I refer "*Amblyscelis*" *ferrugineus* and *vittipennis*, Gorh., the latter name, as well as *Triplax dorsalis*, Kolbe, being synonymous with *Triplax marginata*, Qued. *A. nigripennis*, Arr., I am now satisfied is the same as *Amblyopus natalensis*, Crotch.

I do not know the species for which Gorham has made the genus *Pycnogensteria*, but, as he has indicated no features of any generic significance by which it can be distinguished from *Petaloscelis*, I think it will be best to regard it as synonymous with that.

In 'Notes from the Leyden Museum,' 1888, p. 147, Gorham has changed the name *Cyrtotriplax* (*Tritoma*) *senegalensis*, Crotch, to *Amblyopus rotundatus* (omitted from Kuhn's Catalogue), but without reason, for Crotch's species agrees well with *Tritoma*. *Petaloscelis nigrinus*, Gorh., and several other African species are now added to this genus. They differ considerably in the form of the tibiæ and antennæ, but the transition is gradual from species to species, and I have found nothing to justify adding to the already too numerous genera.

Closely related to *Tritoma* is the peculiar genus *Palæolybas*, which has never been adequately described, although various species have been named by Crotch and Gorham. It has been quite unnaturally placed with South-American forms on account of its globose shape. In reality, it differs from *Tritoma* only in minor details, viz. the shape of the body, short legs, feeble antennæ, and broadly bilobed prosternum. An important feature hitherto overlooked is the marked

sexual dimorphism of some at least of the species. The males are characterised by greatly dilated tarsi; but, in several species, they have a more remarkable peculiarity in a conspicuous opaque area upon the posterior part of the elytra. Analogy would lead us to consider this distinctive of the females, as in Water-beetles, various Lamellicornia, and other groups in which a similar phenomenon occurs; but this is not the case. The dilated tarsi are not by themselves sufficient to determine the sex, for, although almost invariably indicative of the male, in certain genera of Languriinæ, a closely related group, it is the female in which the tarsi are most dilated. In these and other cases the determination of the sex from external indications only has led to totally wrong conclusions, and dissection is essential to absolute certainty.

As is frequently found with secondary sexual characters, the opaque dorsal area is not found in all the species of the genus. I have found it in three, in one only of which (*P. andrea*, Crotch) both sexes are known, but in all it is confined to male specimens. In *P. coccinelloides*, Crotch, *P. dorsalis*, Gorh., and *P. bizonatus*, sp. n., both sexes are equally smooth. Although it has not hitherto been recorded, this curious phenomenon is also found in the genus *Neotriplax*—in a strongly marked form in *N. atrata*, Lewis, and to a less extent in *N. lewisi*, Crotch, both Japanese species.

Dacne (*Engis*) *æquinoctialis*, Thoms., is almost certainly the species later described by Crotch as *D. capensis*, which has an exceedingly wide range in Africa.

The only known African representatives of the *Encaustes* group are here described. Gorham described in 1883 a species, *Micrencaustes torquata*, the habitat of which he stated to be Old Calabar; but in 1901 he expressed himself doubtful of its African origin. In the British Museum there is a specimen of this species, derived, like Gorham's type, from Andrew Murray's collection, and labelled "Malay Peninsula."

The true systematic position of this group has never been recognized. The monographer of the Erotylidæ, Lacordaire, in his Synopsis of the genera, divided them into two series, at the head of each of which he placed an isolated genus as to the actual affinities of which he was evidently uncertain. The first of these, *Encaustes*, on account of its large size and elongate shape, is, not unnaturally, generally associated with the other large Old World species represented by those now called by M. Bedel *Mimodacne*; but Chapuis has pointed out that Lacordaire, in adopting this view, was

misled by an incorrect observation of the form of its maxillæ, and has removed it from the first series. He has not, however, transferred it to the second series, but has made for it a special group, of which the distinguishing features have little value. The projecting shoulders, which are chiefly relied upon, disappear in the species now called *Micrencaustes*.

The second series (*Erotylini genuini*) of Lacordaire (the *Erotylites* of Chapuis) consists entirely of Neotropical genera, with the addition of the single Old World genus *Aulacochilus*. A comparison between this genus and *Micrencaustes* will reveal the interesting fact that they are really very closely allied—and indeed identical—in all essential points of structure, differing only in the shorter and more ovate form, shorter antennæ, and less dilated tarsi of *Aulacochilus*. The peculiar form of the antennal club, the coarsely faceted eyes, strongly transverse last joint of the maxillary palpus, and the general conformation of the mouth are the same. Most important of all is a peculiar development of the genæ, which distinguishes this group of genera from all others. These are sharply elevated at the sides of the mouth, walling-in the latter in continuation of the mandibles, and forming a rest against which the delicate sensory surface of the last joint of the maxillary palpus is applied when in repose. This conformation I consider most essentially distinctive of the *Encaustini*, consisting of the four genera *Aulacochilus*, *Micrencaustes*, *Encaustes*, and *Asmonax*. As showing the closeness of the relationship between the first two of these, I may mention that the Philippine species described by M. Bedel as *Aulacochilus maximus* would, in my opinion, be better placed in *Micrencaustes*. It is nearly related to *M. 6-guttata*, Gorh.

For the purpose of the present revision, I have examined the African types of Crotch in the Cambridge Museum, but these do not include the species described by him from Andrew Murray's collection, the location of which is unknown to me.

The following Synopsis gives briefly the differential characters of all the genera of *Erotylidæ* which can, in my opinion, be admitted as African :—

Club of the antenna articulated.

4th joint of the tarsus reduced.

Last joint of the maxillary palpus longitudinal.

Antennæ very slender, with the club very

narrow *Linodesmus*.

Antennæ not very slender, with the club well-marked.	
Joints of the antennal club strongly oblique.	<i>Mimodacne.</i>
Joints of the antennal club not strongly oblique.	
Body strongly tapering behind, prothorax relatively broad	<i>Plagiopisthen.</i>
Body not strongly tapering behind, prothorax not very broad	<i>Megalodacne.</i>
Last joint of the maxillary palpus transverse.	
Genæ sharply elevated at the sides of the mouth.	
Body and antennæ long; tarsi more dilated.	
Prosternum not pointed in front	<i>Encaustes.</i>
Prosternum pointed in front	<i>Micrencaustes.</i>
Body and antennæ short; tarsi less dilated.	<i>Aulacochilus.</i>
Genæ flat.	
Head not dilated.	
Club of the antenna very broad and compact	<i>Petaloscelis.</i>
Club of the antenna not very broad and compact.	
Eyes very large and coarsely faceted ..	<i>Amblyopus.</i>
Eyes not very large and coarsely faceted.	
Prosternum not bilobed behind	<i>Tritoma.</i>
Prosternum bilobed behind	<i>Palæolybas.</i>
Head greatly dilated	<i>Zythonia.</i>
4th joint of the tarsus not reduced	<i>Dacne.</i>
Club of the antenna solid	<i>Eucestus.</i>

At the end of this paper I have given a revised synonymical list of the African species.

Megalodacne læta, sp. n.

Nigra, nitidissima, singulo elytro bis rufo-fasciato, fasciis valde undulatis, ad suturam haud attingentibus, prima post-humerali, secunda post-mediana, obliqua; elongato-ovalis, convexa, capite et pronoto sat fortiter et crebre, sed hujus medio levius, punctatis, pronoti lateribus leviter arcuatis, distincte marginatis; elytris leviter punctato-striatis, subtilissime punctulatis:

♂, tibiis omnibus valde arcuatis, abdomine subtus medio dense flavo-pubescenti.

Long. 10-11 mm.; lat. max. 4·5-5 mm.

NYASALAND: Mlanje.

A series was taken by Mr. S. A. Neave in November and December.

It is a species of similar size, shape, and markings to *M. (Episcaphula) repanda*, Kl., and *piciventris*, Gorh., but is not red beneath and is much more smooth and shining

than the latter and rather broader. The anterior red band sends a branch almost to the basal margin of the elytron, and the posterior band is very wavy and oblique, not arched, as in *M. piciventris*, nor simply transverse, as in *M. repanda*. The third joint of the antenna is as long as the two following.

In addition to the strongly curved tibiæ, the male has a patch of thick pubescence on each ventral segment, the patches gradually increasing from the basal segment, where the hairs are few, to the terminal one, which is almost covered by them.

Megalodacne pubescens, sp. n.

Nigra, elytrorum macula basali angulata, ad basin et marginem externam producta, aliaque ante-apicali undulata ad margines haud attingenti, flavis; valde elongata, angusta, supra sat crebre et fortiter punctata, undique æqualiter minute pubescens, capite et pronoto fortiter punctatis, hoc lateraliter densius, marginibus antice arcuatis, postice fere rectis; scutello late transverso; clytris confuse haud fortiter punctatis, sine lineis distinctis; pedibus simplicibus; antennarum clava elongata, stipitis articulo tertio quam quartum parum longiori.

Long. 6·5 mm.; lat. max. 2·5 mm.

N.E. RHODESIA: Fort Jameson, 3800 ft. (*S. A. Neave*, June).

This little species is easily recognizable from its long and narrow form and the close pubescence with which it is entirely clothed. The two red elytral marks on each side are far apart and not broad, the basal one a little waved behind and having in front a straight branch which extends to the basal margin, the posterior one toothed in front and arched behind.

The legs are simple in both sexes, but the male has patches of longer hairs upon the ventral segments, increasing in extent from the base to the extremity.

Encaustes africana, sp. n.

Nigra, parum nitida, elytrorum annulo humerali, ad laterem paulo retrorsum producto, lunula obliqua post-mediana, a sutura remota aliaque subapicali uncinata, pallide flavis; elongata, angusta, clypeo fortiter punctato, fronte fere levi; pronoto paulo latiori quam longiori, irregulariter disperse punctato, lateribus bene marginatis, antice et postice fere rectis, angulis anticis paulo productis, posticis fere rectangulis;

scutello lato; elytris subtiliter seriato-punctatis; pedibus gracilibus.

Long. 21 mm.; lat. max. 8 mm.

UPPER CONGO: Kasongo to Stanley Falls.

A single specimen was found by Mr. A. F. R. Wollaston.

This, the first discovered African species of the genus, is unlike any other. It is very smooth above, but not shining, and the pale markings are of a bright yellow colour, quite different from the orange and red of the Oriental species. It is long and narrow, with slender legs, not very strongly dilated tarsi, and delicate but not long antennæ, with the club very small. The pale shoulder-patch is almost square in shape, with a round black spot in the centre; the postmedian lunule is remote from it and curves forward parallel to, but at a distance from, the suture; and the apical mark is V-shaped, with its outer limb produced forward until it almost touches the postmedian one.

Micrencaustes spinipes, sp. n.

Flava, capite, pronoti medio, scutello, elytrorum marginibus, abdomine (medio excepto), pedibus antennisque rufis, pronoti maculis 5, elytrorum plagis duabus communibus, punctis 3 basalibus, una laterali ante medium posita unaque ante-apicali majori nigris; modice elongata, parum nitida, capite parce punctato, clypeo autem crebre et fortiter, pronoto minute et parce, basin versus fortius punctato; elytris leviter striato-punctatis; pedibus validis, tibiis omnibus apice extus acute spinosis; antennarum clava parva.

Long. 19 mm.; lat. max. 7.5 mm.

BELGIAN CONGO: Bakuba Country.

The single specimen in the British Museum was found by Mr. T. A. Joyce.

This also is like no other species yet known. The ground-colour is rust-red, with the sides of the pronotum and the elytra bright yellow edged with red, and the sternum, the middle of the abdomen, and rather complicated markings on the upper surface black. The black markings consist of an oblique inner dumb-bell shaped bar and outer spot on each side of the pronotum, and, upon the elytra, three small basal spots on each (the two outer ones elongate), a common transverse patch just behind the scutellum and another larger and broader one behind the former, a small lateral spot between the two large patches, and a larger spot near the apex of each elytron.

The insect is moderately elongate, smooth and shining,

with the clypeus closely and coarsely punctured, the forehead finely and sparsely, the eyes rather large and coarsely faceted, the pronotum finely punctured, coarsely near the base, without basal foveæ, the sides feebly curved, slightly convergent, the front angles slightly produced, the hind angles nearly right-angles, and the elytra rather feebly seriate-punctate. The legs are rather slender, all the tibiæ sharply spinose externally near the end. The club of the antenna is small, compact, and finely pubescent.

Petaloscelis fulvus, sp. n.

Omnino fulvus, nitidus, haud longe ovatus, sat convexus, capite et pronoto subtiliter punctatis, pronoto lateraliter modice crebre, lateribus parum arcuatis, angulis fere rectis, basi leviter lobato, scutello brevi, elytris distincte sed subtiliter punctato-striatis, intervallis subtilius punctulatis; pedibus brevibus, tibiæ extremitatibus latissimis; antennarum articulis tribus ultimis valde dilatatis, conjunctum vix longioribus quam latoribus.

Long. 4 mm.; lat. max. 2.25 mm.

S. RHODESIA: Salisbury (G. A. K. Marshall, Dec. 1897).

This is shorter, more ovate and convex than *P. hæmorrhous*, but a little more elongate than *P. nigrinus*, and is entirely tawny yellow in colour, with the legs and antennæ very short and stout and the upper surface finely and moderately closely punctured, but rather shining.

Petaloscelis hilaris, sp. n.

Omnino læte rufus, antennis (articulis tribus basalibus exceptis) nigris; ovatus, convexus, capite et pronoto ubique fortiter et crebre punctatis, oculis parvis, subtiliter granulatis, pronoto haud convexo, lateribus vix arcuatis, antrorsum fortiter convergentibus, angulis posticis acutis; elytris leviter striato-punctatis, intervallis subtiliter punctulatis; tibiis leviter dilatantibus; antennis sat crassis, articulis tribus ultimis late dilatatis.

Long. 7-8 mm.; lat. max. 4-4.5 mm.

GOLD COAST: Tamsoo, near Tarkwa (G. A. Higlett); S.E. CAMEROON; UGANDA: Chagwe, Mabira Forest, 3500-3800 ft. (S. A. Neave, July).

The above localities represent a very extensive area of distribution, but the insect is a very well-marked and unmistakable one. It was, without reason, identified by Mr. Gorham as *Zythonia fulva* of Westwood, and is nearly allied to *Petaloscelis* ("*Zythonia*") *anthracinus*, Gorch. Its

size and shape are similar, but it is a little broader, more convex, and less shining, the upper surface being closely punctured, the head and pronotum deeply and strongly. The abdomen is punctured and pubescent beneath.

Petaloscelis monommoides, sp. n.

Niger, nitidus, abdomine pedibusque rufis, antennis piceis, basi et apice rufescentibus; sat longe ovalis, parum convexus, capite fortiter punctato, oculis grosse granulatis, haud magnis; pronoto subtiliter punctato, lateribus paulo fortius, marginibus lateralibus fere rectis, angulis omnibus acutis; scutello fere semicirculari; elytris subtiliter punctato-striatis; pedibus sat validis, tibiis apicem versus paulo dilatantibus; antennis validis, articulis tribus ultimis fortiter transversis.

Long. 5 mm.; lat. max. 2·75 mm.

CAMEROON (*G. Schwab*).

The single specimen has been presented to the British Museum by Professor R. Thaxter. It resembles *P. anthracinus*, but is smaller, with longer and stouter legs and antennæ, which are also paler in colour. It is very smooth and shining above, with the elytra very lightly punctate-striate; but the head and the sides of the pronotum are much more strongly punctured than in *P. anthracina*, and the eyes are larger and more coarsely faceted. The third joint of the antenna is as long as the two succeeding ones together, the fourth to the seventh are round and bead-like, and the last three more than twice as broad as they are long. The prosternum is carinate anteriorly and dilates from the middle to the posterior edge, the lateral striæ almost meeting in the middle. The mesosternum bears an incised semicircular line.

Amblyopus pulchellus, sp. n.

Læte rufus, elytrorum macula rotundata basali, alia laterali ante medium tertiarque communi post medium, femoribus tibiis clavaque antennali nigris; elongatus, oculis magnis, grosse reticulatis, pronoto subtiliter sat crebre punctato, lateribus convergentibus, vix arcuatis, angulis posticis rotundatis; elytris punctato-striatis, intervallis subtiliter sat crebre punctulatis; pedibus haud brevibus, tibiis ad extremitates modice dilatatis; antennarum clava angusta, laxè articulata.

Long. 7-8·5 mm.; lat. max. 3·5-4 mm.

CAMEROON (*G. Schwab*).

Two specimens in the British Museum have been sent by Professor R. Thaxter.

The striking pattern upon the elytra, consisting of five large round black spots placed in a circle upon their basal part, together with the black femora and tibiae and pale tarsi, render this species very easy of recognition. The second, and smaller, specimen is without the spots: but this is apparently owing to immaturity, the red ground-colour being paler. The eyes are very large and prominent, the diameter of each scarcely less than that of the space between them. The club of the antenna is long, narrow, and loosely articulated, the last joint small and globular and the two preceding ones triangular.

Amblyopus lateralis, sp. n.

Niger, elytris, abdomine, tarsis, antennarumque apicibus rufo-fulvis, elytris extus nigro-cinctis, margine antica pone scutellum triangulariter dilatata; elongatus, angustus, oculis magnis, grosse granulatis; pronoto undique subtiliter punctato, lateribus fere rectis, angulis omnibus paulo obtusis, basi medio leviter lobato: scutello transverse pentagonali; elytris subtiliter punctato-striatis, intervallis subtilissime punctulatis; pedibus sat longis, tibiis ad extremitates modice dilatatis; antennarum articulis 3-8 plus minusve elongatis, 9-11 transversis, laxè articulatis.

Long. 7-8.5 mm.; lat. max. 3.5-4 mm.

UGANDA: Entebbe (C. C. Gowdey, May).

The coloration of this species also is quite distinctive and peculiar, the elytra, abdomen, and tarsi being orange-yellow, the elytra completely encircled with black, which embraces the scutellum and extends behind it a short distance down the suture. It is of similar size to *A. pulchellus*, but less convex and rather more finely punctured, with the elytra more elongate, more straight-sided and tapering. The legs are a little longer and the antennae rather more slender. The prosternum is triangular, broad and slightly emarginate behind, and the mesosternum is almost square.

Amblyopus tristis, sp. n.

Nigro-piceus, clypeo, scutello, corporeque subtus rufo-piceis, pedibus et antennis læte rufis; modice elongatus, parum nitidus, capite leviter punctato, oculis magnis, grosse granulatis; pronoto minute sat crebre punctato, lateribus leviter arcuatis; scutello lato, punctulato; elytris fortiter punctato-

striatis, intervallis subtiliter crebre punctulatis; tibiis apice latissimis, acute angulatis; antennis crassis, clava lata, haud truncata.

Long. 5.5 mm.; lat. max. 2.75 mm.

NYASALAND: Mlanje (*S. A. Neave*, Dec., Jan.).

This species and *Tritoma nigrina*, Gorh., were found together in the above locality, but the latter was far more numerous. *A. tristis* bears considerable resemblance to that species, but is rather larger and more elongate, with larger and more coarsely-facetted eyes. The antennæ are stout, the third joint only slightly elongate, the club compact and broadly oval in shape, not abruptly truncate at the end. The prosternum and abdomen are very densely punctured, and the entire lower surface is finely pubescent.

This is rather less elongate in form and a little smaller than the other African species which I refer to *Amblyopus*.

Tritoma soror, sp. n.

Omnino ferrugineo-rufa, pedibus paulo pallidioribus, antennarumque clava nigra; late ovalis, convexa, nitida, capite et pronoto subtiliter punctatis, oculis minute granulatis, pronoti lateribus leviter arcuatis, elytris minute striato-punctatis, intervallis subtilissime punctulatis; pedibus robustis, tibiis 4 posterioribus ad extremitates late dilatatis, antennarum clava anguste ovata:

♂, pedibus validioribus, femoribus incrassatis, tibiisque longioribus atque magis dilatatis.

Long. 4 mm.; lat. max. 3 mm.

NYASALAND: Mlanje (*S. A. Neave*, Jan.).

This is closely related to *T. senegalensis*, Crotch, and of the same form and colour, but more finely punctured, especially upon the pronotum. The last five joints of the antenna (not three only) are black. The size and general shape are almost those of the familiar European species, *T. bipustulata*, but the colour is brick-red, the legs are stouter, and the club of the antenna is long and narrow.

Tritoma spilota, sp. n.

Læte sanguineo-rufa, pronoti punctis 2 basalibus, elytrorum punctis 4 ante medium transverse positis, antennarumque clava nigris; ovalis, convexa, nitida, supra ubique sat fortiter et crebre punctata, oculis parvis, minute granulatis, pronoti lateribus æqualiter subtiliter arcuatis, angulis anticis acutis; elytris striato-punctatis, intervallis modice crebre, parum minute

punctatis; pedibus robustis, tibiis ad extremitates modice dilatatis; antennarum articulis tribus ultimis transversis, sat magnis.

Long. 5 mm.; lat. max. 3 mm.

UGANDA: Daro Forest, Toro, 4000-4500 ft. (*S. A. Neave*, Oct.).

I know only a single specimen of this beautiful little species, which is quite unlike any other. It is bright scarlet, with a black spot on each side of the pronotum at the base and two upon each elytron, one behind the shoulder and another opposite to it near the suture, neither quite touching the margin. It is rather strongly and closely punctured, the tibiae are moderately dilated, and the club of the antenna is large and black.

Tritoma partita, sp. n.

Sanguineo-rufa, elytrorum dimidio postico, femoribus, tibiis, antennarumque clava nigris; ovalis, convexa, nitida; capite sat crebre punctato, oculis sat parvis et minute granulatis; pronoto subtiliter punctato, lateribus paulo fortius, marginibus lateralibus leviter arcuatis, angulis anticis acutis, basi fortiter lobato; scutello lato, fere laevi; elytris antico sat fortiter seriato-punctatis, lineis posticis fere oblitteratis, intervallis minute inaequaliter punctulatis; tibiis late triangulariter dilatatis; antennis brevibus, articulis tribus ultimis minutis, transversis, parum compactis.

Long. 5-5.5 mm.; lat. max. 3-3.5 mm.

NYASALAND: Mlanje (*S. A. Neave*, Jan.).

Two specimens.

T. partita approaches the genus *Palaelybas* in structure as well as in appearance, but the prosternum is not bilobed behind. Its coloration is remarkable. It is deep red anteriorly, with rather less than half the body posteriorly (*i. e.*, the hinder two-thirds of the elytra), together with the femora and tibiae, jet-black. It is regularly oval, highly convex, and very smooth and shining, and the elytra exhibit at the base well-marked lines of punctures which become gradually fainter and are indistinct behind.

Tritoma alternans, sp. n.

Rufa, elytrorum basi et apice antennarumque clava nigris; elongato-ovalis, modice convexa, nitida, capite et pronoto sat fortiter et crebre punctatis, hujus lateribus subtiliter arcuatis, angulis omnibus obtusis; scutello leviter punctato; elytris

leviter striato-punctatis, intervallis parum minute sat crebre punctatis; pedibus modice validis, tibiis apice parum dilatatis; antennarum articulo tertio ad tria sequentia longitudine æquali, tribus ultimis transversis.

Long. 5 mm.; lat. max. 3 mm.

UGANDA: Unyoro, Budongo Forest, 3400 ft. (*S. A. Neave*, Dec.).

A single specimen.

The coloration of this species is also highly distinctive. It is deep red, with about one-sixth of the elytra from the base (not including the scutellum, which is red) and about one-fourth from the posterior end black, and the last four or five joints of the antennæ of the same colour. It is smooth and shining, rather elongate and not very convex, with the upper surface closely and distinctly punctured, but the elytral striæ feeble.

Tritoma tibialis, sp. n.

Nigra, nitida, antennis tibiis tarsisque flavis, elytrorumque macula magna basali ab humero ad scutellum pertinenti rufa; haud longe ovalis, parum convexa, capite crebre et subtiliter punctato, oculis parvis, minute granulatis; pronoto lato, similiter sed minus crebre punctato, lateribus anguste marginatis, antice valde arcuatis, postice rectis, angulis omnibus obtusis; scutello lævi, angulato; elytris fortiter punctato-striatis, interstitiis subtilissime punctulatis; tibiarum extremitatibus fortiter dilatatis, antennarum clava late ovali, parum compacta.

Long. 3-4 mm.; lat. max. 2-2.5 mm.

NYASALAND: Mlanje (*S. A. Neave*, Jan.).

This appears to resemble *T. liberiana*, Gorh. It is more elongate and less convex than *T. bipustulata*, the red elytral spot is large, extending the whole width of the basal margin, evenly rounded and generally more than one-third as long as the elytra, and finally the antennæ, tibiæ, and tarsi are wholly pale. The tibiæ are very strongly dilated at the end.

Tritoma flaviventris, sp. n.

Nigra, nitida, corpore subtus, antennis, pedibus elytrorumque macula magna basali communi scutellum amplectenti, ad humeros haud attingenti, fulvis; haud longe ovalis, parum convexa, capite et pronoto sat fortiter et crebre punctatis, oculis prominentibus, modice granulatis; pronoto lato, lateribus marginatis, antice valde arcuatis, postice fere rectis, elytris fortiter punctato-striatis, intervallis subtiliter punctulatis; tibiis

ad extremitates paulo dilatatis; antennarum clava laxè articulata.

Long. 4·5 mm.; lat. max. 2·5 mm.

UGANDA: Entebbe (C. C. Gowdey, May).

There are two specimens in the British Museum.

T. flaviventris is closely similar to *T. tibialis*, but the lower surface, as well as the legs and antennæ, is pale, and the pale basal patches of the elytra unite at the suture and do not extend to the shoulders. It is rather larger, relatively broader, with the pronotum more strongly punctured, the tibiæ much less dilated at the ends, the antennal club more loosely jointed and less short and broad, and the eyes not very small or very finely faceted.

Paleolybas nigrocinctus, sp. n.

Sanguineo-rufus, elytrorum dimidio anteriori nigro, hujus partis margine posteriori dentata; breviter ovalis, convexus, nitidus, capite et pronoto sat crebre et æqualiter punctatis, elytris subtiliter punctato-striatis, interstitiis subtilissime punctulatis; antennis exiguis, articulis tribus ultimis minutis:

♂, elytrorum dimidii postici parte media subopaca.
Long. 8 mm.; lat. max. 5·5 mm.

OLD CALABAR (*A. Murray*).

The two specimens from which this is described formerly belonged to the late Alexander Fry, who obtained them from Murray's collection, from which also *P. andree* and *humeralis* were described by Crotch. Whether all were actually collected in Old Calabar is perhaps a little doubtful, for *P. coccinelloides*, Crotch, and *P. dorsalis*, Gorb., were also attributed by Murray to the same locality, and the former at least certainly does not occur there, belonging to South-Eastern Africa (Nyasaland, Portuguese East Africa, Transvaal, Natal, etc.). Specimens in the British Museum which I have identified as *P. andree* are from the French Congo. The male has in that species a conspicuous round area of an opaque texture upon the posterior half of the elytra. The two specimens of *P. nigrocinctus* are both males, and the hinder part of the elytra is less shining than the remaining surface, but the area is not definitely circumscribed nor conspicuous. The red colour is much brighter than in the other species, and the black band is much wider, occupying more than a third of their length.

Palæolybas apicalis, sp. n.

Sanguineo-rufus, elytrorum humeris, marginibus externis parteque tertia apicali, antennarumque clava nigris; late ovalis, convexus, nitidus, capite et pronoto subtilissime haud crebre punctatis, hujus lateribus bene arcuatis, angulis anticis haud acutis, elytris vix perspicue striato-punctatis; antennarum articulis tribus ultimis minutis:

♂, elytrorum dimidio postico medio opaco, velut sericeo.

Long. 8-9 mm.; lat. max. 6 mm.

UGANDA: Entebbe (C. C. Gowdey, Aug., Nov.).

Three practically identical specimens are all males, and the opaque round area common to the two elytra upon their posterior half is very distinct. The species closely resembles *P. cychramoides*, Gorh., of which I have seen only a single female; but, besides a considerable extension of the black colour at the apex of the elytra, it is larger and relatively broader, with the puncturation finer, the sides of the prothorax more rounded, and the front angles blunter. The antennæ are very delicate, with joints 4 to 8 rather elongate.

Palæolybas bizonatus, sp. n.

Sanguineo-rufus, pronoto maculis tribus rotundis (una mediana majori, unaque utrinque versus angulos anticos sita), elytris zonis duabus (prima basali, secunda paulo post medium) undulatis lateraliter anguste connexis, pedibus antennarumque clava nigris; ovalis, convexus, capite pronotoque minute sat crebre punctatis, elytris minutissime punctato-striatis; antennarum articulis tribus ultimis haud minutis.

Long. 5.5-8 mm.; lat. max. 4.5-5 mm.

UGANDA: Tero Forest (C. C. Gowdey, July), Southern Toro, Mbarara, 3800-4200 ft. (S. A. Neave, Oct.).

This is rather less broadly oval than the two preceding species and rather less shining, the puncturation being rather less fine than in *P. apicalis*, but more so than in *P. nigrocinctus*. The antennæ are a little shorter and stouter.

The sexes differ only in the more dilated tarsi of the male.

Palæolybas latus, sp. n.

Sanguineo-rufus, pronoto utrinque minute nigro-punctato, elytris extus bimaculatis (macula humerali aliaque paulo post medium intus leviter hamata, maculis duabus ad marginem connexis), pedibus (tarsis exceptis) antennarumque clava nigra; ovalis,

convexus, nitidus, capite et pronoto minute sat crebre punctatis ;
antennis brevibus, articulis tribus ultimis transversis.
Long. 8 mm. ; lat. max. 5 mm.

UGANDA: Buamba Forest, Semliki Valley, 2300-2800 ft. (S. A. Neave, Nov.).

The single specimen is a male and is without an opaque area upon the elytra.

It is a closely related species to *P. bizonatus*, the shape and sculpture being the same ; but the large median thoracic spot is absent and the two black bands of the elytra are reduced to two large spots at each outer margin, united externally, the first placed at the shoulder and the second behind the middle and a little produced internally.

Palæolybas rufocinctus, sp. n.

Sanguineo-rufus, elytris antennarumque clava nigris, illorum fascia mediana communi ad margines externas haud attingenti apicibusque extremis sanguineo-rufis ; late ovatus, convexus, nitidus, capite et pronoto subtiliter sat crebre punctatis, elytris subtiliter punctato-striatis, interstitiis subtilissime punctulatis, antennarum articulis tribus ultimis transversis :

♂, elytrorum dimidii postici parte mediana opaca.

Long. 8.5 mm. ; lat. max. 6 mm.

N. RHODESIA: Katanga, 150-200 miles W. of Kambove, 3500-4500 ft. (S. A. Neave, Oct.).

A single male specimen.

This is rather larger and relatively broader than *P. bizonatus*, but not quite so large or so broad as *P. apicalis*, and besides the different coloration is distinguished by a puncturation of the upper surface which is stronger than in *P. apicalis*, while that of the pronotum is more scattered than in *P. bizonatus*. The antennæ also are a little shorter and more compact.

Palæolybas ferrugineus, sp. n.

Omniño ferrugineus, antennarum clava solum nigra ; ovalis, convexus, capite crebre punctato, pronoto nitido, distincte sed minus crebre punctato, lateribus vix arcuatis, elytris parum nitidis, subtiliter punctato-striatis, interstitiis haud sparse aut subtilissime punctulatis ; antennis brevibus, clava elongata, paulo dilatata, haud compacta.

Long. 6.5 mm. ; lat. max. 4.5 mm.

UGANDA: Tero Forest, S.E. Buddu, 3800 ft. (S. A. Neave, Sept. ; C. C. Gowdey, July).

Only a single male was found by each collector. Unlike the other species, this is uniformly rusty-brown instead of blood-red, and the club of the antenna alone is black. The pronotum is very smooth and shining, but the head and elytra are scarcely shining (in the male at least), their puncturation being less fine and scanty than usual. The antennæ are very delicate and the club is rather elongate, with moderately broad but loosely articulated joints.

Euxestus angustus, sp. n.

Rufo-piceus, antennis pedibusque pallidioribus; anguste oratus, convexus, nitidus, corpore supra ubique æqualiter sat fortiter et crebre punctato; antennis indistincte 11-articulatis, clava solida, triangulari, apice late truncata.

Long. 2.5 mm.; lat. max. 1 mm.

NATAL: Durban (*F. Muir*), Malvern (*G. A. K. Marshall*, Sept.); RHODESIA: Salisbury (*G. A. K. Marshall*, Dec.).

Although closely related to *E. parki*, Woll., this is very distinctly different. It is of practically the same size and colour, but considerably more elongate and more strongly, closely and evenly punctured on the head, pronotum and elytra. The antennæ have the same peculiar conformation, but are rather less highly modified, the eleven joints composing each being distinguishable, although the articulations are not all perfect. The basal joint is large, but rather less so than in the typical species; the second smaller, but well marked; the third elongate; the fourth to the sixth very small and imperfectly articulated; the seventh to the ninth progressively widening, the ninth twice as wide as it is long and closely applied to the base of the club, which forms a flattened sphere, its broad terminal part plainly formed by the eleventh joint, which appears as though almost sunk into the tenth.

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paradoxus, *Thoms.*
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XIII.—*New Indo-Malayan Species of Lepidoptera.*

By Colonel C. SWINHOE, M.A., F.L.S., &c.

Family *Limniinæ*.

Salatura affinis olga, nov.

♂. Blackish brown with a slight bronzy tinge, markings white: fore wing with a slight streak beyond the middle of the cell, a spot on the middle of the discocellulars, two subcostal spots above it, the lower one linear; a subapical series of spots as in *affinis*, but all very small, the three near the costa quite minute; a short white bar at the base of interspace 2, a long one below it as in *affinis*, a small round spot beyond the upper bar, and a double row of small round submarginal spots, some of the upper and lower ones more or less obsolete: hind wing with the white middle band divided by the veins much as in *affinis*, but with the outer ends rounded; a double submarginal row of spots, the lower abdominal area pale brownish grey. Underside differs materially from that of *affinis*: fore wing with the markings as on the upperside: hind wing without any of the orange spots which are present in *affinis*; the markings as on the upperside, a V-shaped dislocated mark below the costa near the base, and no markings whatever between the central white part and the submarginal double series of white spots.

Expanse of wings, ♂, 3 inches.

Hab. New Britain.

The underside much resembles the underside of *S. decentralis*, Fruhstorfer, from Bangkei (Berl. ent. Zeit. 1899, p. 69).

Salatura affinis nora, nov.

♀. General pattern and colour very similar to that of *olga*; the palpi, head above and below, and the thorax beneath prominently white-spotted, the wings with all the white bands and spots much larger and more extended: fore wing with a white spot on the centre of the costa, the white spot outside the upper white bar not present. On the underside the basal portion of the fore wing is suffused with a bronzy tinge, the underside of the hind wing as in *olga* and also without any orange markings.

Expanse of wings, ♀, $3\frac{2}{10}$ inches.

Hab. Kiriwini Island, Tobriand group.

Family Nymphalidæ.

Dracænura arfakalis, nov.

♂ ♀. Frons, head, and thorax dark brown: fore wing dark copper-brown, shining, uniform in colour; an indistinct black spot in the cell and another at the end, no other markings: hind wing pure white, with an all-round marginal band of the colour of the fore wing, well defined, thickest at the apex, slightly suffused on its inner margin; cilia of both wings white. Antennæ grey, with pure white points on the joints; abdomen with the basal half white, outer half blackish; anal tuft white. Underside: wings as above, fore wing paler in colour; palpi brown; face, pectus, body, and legs white.

Expanse of wings, ♂ ♀; $1\frac{2}{10}$ inch.

Hab. Arfak Mountains, North New Guinea, 4000', 6000' (*Pratt*).

Family Lycænidæ.

Rapala francesca.

Rapala francesca, Swinhoe, Lep. Ind. ix. p. 52, pl. 716. figs. 4, 4 a, ♂ (1911).

♀. Upperside paler purplish black than in the male and without the gloss; underside bright ochreous yellow; all the markings above and below (except, of course, the sexual patch) exactly as in the male.

Expanse of wings, ♀, $1\frac{6}{10}$ – $1\frac{7}{10}$ inch.

Hab. Khasia Hills.

Two examples received with two males from my native collector in Cherra Punji.

Loxura atymnus luzonica, nov.

♂. Upperside much as in *L. arcuata*, Moore, from Ceylon, but the outer marginal black band of the fore wing is more attenuated towards the hinder angle; the outer marginal brown line of the hind wing is a mere thread and the cilia are pale yellowish. Underside differently coloured to any of the other forms of this group, being of a very clear and pure and uniform dark orange-ochreous tint, the markings almost obliterated, the two outer transverse lines only slightly visible on either wing and straighter and nearer to each other than usual.

♀. Paler than in the male, the outer marginal black band broader, the outer margin of the hind wing rather broadly

shaded with grey atoms in the interspaces; the underside much paler, and consequently the outer transverse lines on both wings somewhat more distinct.

Expanse of wings, ♂ ♀, $1\frac{1}{2}$ inch.

Hab. Luzon, Philippines.

Two males and one female.

Mentioned by Fruhstorfer in Stett. ent. Zeit. lvi. p. 221 (1911).

Family Deilemeridæ.

Deilemera kiriwina, nov.

♀. Palpi, frons, head, and thorax deep black, frons with a white streak on each side; a white spot between the bases of the antennæ, a pink line behind each eye, white spots on the collar, shoulders, and thorax (three on each side); abdomen greyish white, three large grey spots on the first segment, with a row of white spots above them, a very large black spot on the anal segment, the rest of the abdomen without any markings: fore wing very deep black, an oblique discal band of very large, conjoined, white spots from the costa to vein 2, the vein-markings very lightly separating them; cilia black, with a white streak below the apex and another at the anal angle, the upper part of this streak extending very shortly into the wing: hind wing white, a broad deep black marginal band, its inner edge slightly sinuous; cilia black, with a short white streak in the middle. Underside: wings as above; fore wing with white basal streaks on the subcostal and median veins; thorax black, with some white marks and some pink streaks in front and at the sides; abdomen and legs white.

Expanse of wings, ♀, 2 inches.

Hab. Kiriwini Island, Tobriand group.

Not allied to any form known to me.

Deilemera latera, nov.

♀. Belongs to the *baulus* group. Palpi white, last joint black; head luteous, a large black spot on the frons, one at the base of each antenna, and another behind; collar, thorax, and abdomen white, two spots on the collar, three stripes on the thorax, three spots at the base of the abdomen, and a thin black band on each segment: fore wing black, the veins not pale as is usual in this group; the discal macular band as in *baulus*, but there are only five spots, all much smaller and well separated from each other: hind wing white,

with black marginal band as in *baulus*. On the underside the body and legs are pure white, with some black spots on the thorax and a double row of black spots on each side of the abdomen.

Expanse of wings, ♀, 1 $\frac{7}{10}$ inch.

Hab. Kiayih, Central Formosa.

Its pure white body separates it from all the other species of this group known to me.

Deilemera everetti, nov.

♂ ♀. Palpi with the first joint yellow, the rest black; frons yellow, with a black medial spot, yellow round the eyes, collar, and thorax, black between the bases of the antennæ and a black line behind; neck with a black spot on each side; thorax with a broad black band down the middle and a narrower band on each side; abdomen black, with thin yellow segmental bands: fore wing deep black, the veins not marked, the usual discal white band of the *baulus* group, but narrow and less oblique, the spot in the third interspace well separated from the others, the spot in the second the largest of all; hind wing white, with some black suffusion at the base and a deep black broad marginal border running thinly up the abdominal margin for a short distance, slightly angled inwards on the veins; a larger angle at vein 2; cilia of both wings uniformly deep black. Underside as on the upperside, the colour deep black; thorax and abdomen yellow, with black medial and lateral spots; legs black streaked with yellow.

Expanse of wings, ♂ ♀, 2 inches.

Hab. Flores (*Everett*).

Family Lymantriidæ.

Dasychira multilineata, nov.

♂. Palpi black at sides, white in front; frons white; fore part of thorax white with grey hairs, hind part dark grey with white hairs on each side; abdomen ochreous grey without markings; antennæ ochreous grey, shaft pure white: fore wing with the ground-colour white, densely irrorated with grey atoms, transverse lines dark brown, mostly highly dentate—one subbasal, acutely angled, with some white on its outer side, three close together, antemedial, one closing the cell and extending to the costa, one postmedial with indications of another close beyond it, one submarginal with some

streaks on the veins running from the margin to the post-medial line; cilia brown: hind wing ochreous grey, with a suffused brownish border, broad on the costa and at the apex, narrowing hindwards, where it becomes submarginal. Under-side ochreous grey; fore wing with all but the costa, outer and hinder margins suffused with brown, a darker brown suffused mark at the end of the cell: hind wing with a brown lunular mark at the end of the cell; body and legs ochreous grey.

Expanse of wings, ♂, $1\frac{9}{10}$ inch.

Hab. Au-San, Central Formosa.

Of the shape of *D. strigata*, Moore (Lep. Atk. p. 56, 1879).

Family Noctuidæ.

Subfamily NOCTUINÆ.

Pleurona simillima, nov.

♂. Of a uniform ochreous-fawn colour; markings above and below similar to those of *P. falcata*, Walker, of which I have a good series from India and Java; but the fore wing is not falcate, it is slightly arched towards the apex, which is not produced, and the outer margin is evenly rounded, not excurved before the middle as in *falcata*, and the cilia is uniformly dark brown, without any white below the apex.

Expanse of wings, ♂, $1\frac{3}{10}$ inch.

Hab. Rangoon, Andamans.

Subfamily FOCILLINÆ.

Zethes limbalis, nov.

♂. Wings shaped as in *Z. inornata*, Walker, xxxiii. p. 848 (1865), described without locality. I have examples, however, that are identical with Walker's type from Simla and Assam; the fore wings are longer and the outer margins of both wings are crenulate, in *inornata* they are smooth; colour throughout of a uniform glaucous-ferruginous, as in *inornata*, but paler; the underside is very pale glaucous-grey, very uniform in colour, and without any markings; on the upper-side there is a black dentated line beyond the middle across both wings, outwardly curved from the costa of the fore wing to vein 2, then nearly straight down to the hinder margin, and on the hind wing bent inwards on the internal vein; this line is edged with pale grey on both wings and has a broad

dark shade on each side of it; the abdomen is longer than usual and there is a large anal tuft.

Expanse of wings, ♂, $2\frac{2}{10}$ inches.

Hab. Su-tcheu-shan, N. China.

Zethes sidonalis, nov.

♂. Of a uniform very pale ochreous-grey colour; thorax covered with black dots; abdomen with indistinct greyish segmental bands, anal tuft rather large: fore wing with a small black round spot in the cell; transverse lines brown, three zigzag lines at the base at equal distances apart, a sinuous line at the middle with a somewhat square outward protrusion below the costa, a lunular line at the end of the cell; a discal slightly sinuous line with a deep outward curve from the costa, then obliquely inwards to the hinder margin at two-thirds from the base; an obscure submarginal diffused band or shade, which contains a brown spot above the hinder angle: hind wing with a small black round spot in the cell, the discal line of the fore wing continued to the anal angle, and a brown spot outside its end; indications of the submarginal shade, but much paler than it is on the fore wing; both wings with submarginal brown dots and fine marginal line.

Expanse of wings, ♂, $1\frac{1}{2}$ inch.

Hab. Goping, Perak.

Capnodes gillolensis, nov.

♂ ♀. Somewhat resembling *C. ceylonica*, Moore, = *C. catuca*, Swinhoe, from Ceylon and South India. Fore wing with a black spot in the cell, another below it, and three in the form of a triangle at the end; a straight black oblique postmedial solid line in the male extending across both wings from vein 7, where it is acutely bent inwards to the costa, to the abdominal margin before the middle; in the female there are no traces of this prominent character, and there is no pale spot on the costa before the apex in either sex as in *ceylonica*, there is a thin dark shade from the apex of this line to the apex of the wing, and a highly crenulate line outside the straight line outwardly curved from its acute apex to near the hinder margin, then straight to the hind margin: on the hind wing there is a similar outwardly curved crenulate line and black marginal dots on both wings. Underside paler, no signs of the straight line; a blurred mark at the end of each cell, a narrow dark shade from the cell-mark of the fore wing to the middle of the abdominal margin of the

hind wing; a postmedial outwardly curved crenulate line from the costa of fore wing to the middle of the abdominal margin of the hind wing; except for the straight black line in the male the markings in both sexes are identical.

Expanse of wings, ♂ $1\frac{2}{10}$, ♀ $1\frac{1}{2}$ inch.

Hab. Gilolo Island (*Doherty*).

Family Hypenidæ.

Genus FOLKA, nom. nov.

Anepa, Swinhoe, Ann. & Mag. Nat. Hist. (7) xv. p. 502 (1905).

Type, *Hypena oxydata*, Hampson, Journ. Bomb. Nat. Hist. Soc. xi. (4) p. 707 (1898).

I had overlooked the fact that *Anepa* is preoccupied by myself in my monograph of the family Lymantriidæ in Trans. Ent. Soc. 1903, p. 478.

Folka bhagha, nov.

♀. Ochreous-fawn colour, paler than *oxydata*: fore wing with the colour of a pure uniform tint, indications of a transverse sinuous subbasal line, a white dot in the cell, an indistinct lunular mark at the end; an erect, rigid, and thick chocolate line or thin band from the costa one-fourth from the apex, straight down to the hinder margin one-fifth from the hinder angle; a very indistinct crenulate transverse line just beyond it; a brown subapical spot; two indistinct spots at the hinder angle; cilia chocolate-brown: hind wing much paler, with an indistinct, outwardly curved, discal greyish line.

Expanse of wings, ♀, $1\frac{2}{10}$ – $1\frac{3}{10}$ inch.

Hab. Khasia Hills.

Fore wing rather prominently angled in the middle, as in *oxydata* and *glaucescens*, Hampson, of which I have several examples of both sexes.

Bomolocha disualis, nov.

♂. Somewhat resembles in markings on the upperside *B. argialis*, Snellen*, from the Celebes, but is a larger insect: upperside olive-brown, a white dot at the base of each antenna; palpi, head, and body without markings: fore wing with an antemedial, indistinct, transverse brown sinuous line, the basal half of the wing much darker than the outer half,

* Tijds. voor Ent. xxiii. p. 118, and xxiv. pl. v. fig. 4 a (1881).

limited by a prominent, sinuous, transverse white line with broad black shading on its inner side ; halfway between this and the outer margin is an indistinct line of black and white points, the upper two subapical, with a curved blackish mark below them ; some white costal dots towards the apex of the wing : hind wing without markings ; both wings with a black marginal line. Underside paler : fore wing with two or three subapical white dots, the hinder marginal space broadly whitish : hind wing with a discoidal brown spot ; an outwardly curved, thin, median brown band, the outer margin rather broadly suffused with brown : body and legs dark brown without markings.

Expanse of wings $1\frac{2}{10}$ inch.

Hab. Kiriwini Island, Tobriand group.

Bomolocha tanis, nov.

♂. Head, body, and wings grey : fore wing with a black triangular patch from the base to the middle, where it is limited by a black transverse line from the costa to the hinder margin, with a rather acute outward angle at its middle, edged outwardly with white on its upper half ; the black becomes diffuse towards the costa, showing a black spot in the cell ; a curved black subapical mark edged with white on its upper side ; two small black spots outwardly pricked with white immediately above it : hind wings grey without any markings. Underside : body, legs, and wings of a uniform pale grey colour ; fore wing with a white costal spot one-fourth from the apex ; three white costal dots at the apex and a subapical white spot.

Expanse of wings, ♂, $1\frac{8}{10}$ inch.

Hab. Kulu.

Like a diminutive *B. colombana*, Moore (Lep. Ceylon, iii. p. 223, pl. 176. fig. 8).

Family Boarmiidae.

Abraxas mosaria, nov.

♂. With narrow elongated fore wing as in *A. unisinuata*, Warren* ; frons white, head white, collar ochreous, thorax and abdomen white ; a black spot on the hinder part of the thorax ; a row of black spots down the middle of the abdomen and a similar row on each side : wings white ; fore wing mostly covered with pale black spots and patches ; a cluster

* Nov. Zool. iv. p. 130 (1897).

of spots at the base ; a patch on the costa before the middle, an angulated large costal patch beyond the middle, and two towards the apex, the first two patches more or less connected with macular bands running outwards, the subapical spot connected with a macular band curving inwards ; many connected spots and patches on the outer third of the wing, all these marks very difficult to describe : hind wing with a discal outwardly curved row of well-separated small spots, three short bands of conjoined spots on the lower part of the abdominal margin, and a series of marginal spots—all these marks pale black ; the wings are very lightly clothed, and consequently the markings of the underside are identical with the markings on the upperside.

Expanse of wings, ♂, $1\frac{1}{2}$ inch.

Hab. Kiayih, Central Formosa.

Family Pyralidæ.

Subfamily PYRAUSTINÆ.

Trichoptychodes delicata.

Trichoptychodes delicata, Swinhoe, Ann. & Mag. Nat. Hist. (6) xiv. p. 207 (1894).

Macaretæra hesperis, Hampson (nec Meyrick), Moths of India, iv. p. 296 (fig.) (1896).

Hab. Assam.

A common species in the Khasia Hills. I have received many examples from my native collector, all males. Sir George Hampson has sunk my genus and species to Meyrick's genus and species from Fiji, the unique type of which is a female, but he has described and figured the Assam male. It is impossible to believe that the two forms so many thousands of miles apart can have any connection with each other, and it is not scientifically justifiable to jump to such a conclusion on account of a similarity of pattern.

Heterocnephæ ægialis, nov.

♂. Allied to *H. scapularis*, Led., of which I have a long series from New Guinea and from Goodenough Island, but is much larger ; palpi and top of head pale ochreous ; head, body, and wings chocolate-brown, much as in *H. scapularis* and *H. lymphatalis*, Swinhoe, from Assam, of which I have also a long series ; thorax with four longitudinal whitish stripes ; abdomen with ill-defined whitish segmental bands, anal tuft large, black : fore wing with a small, triangular, pale ochreous costal patch before the middle and another

twice as large beyond the middle; a pale, outwardly oblique, transverse line across the wing, passing just inside the first costal patch; a duplex, inwardly oblique, brown discal line across the wing passing along the outer margin of the second costal patch, with two pale ochreous-white marks on its outer edge below the costa: hind wing with a large pale ochreous spot in the centre above the middle; two outwardly curved, brown, discal lines, all the veins dark, the abdominal portion of the wing somewhat paler than the rest of the wing. Underside: wings paler in colour, the patches as on the upperside; no transverse lines; the basal part of the fore wing and the basal and abdominal portions of the hind wing suffused with pale ochreous; body and legs pale ochreous.

Expanse of wings, ♂, $1\frac{4}{10}$ inch.

Hab. Kiriwini Island, Tobriand group.

XIV.—*Notes on Asteroidea.* By WALTER K. FISHER,
Stanford University, California.

Poraniomorpha versus *Rhegaster*.—Professor A. E. Verrill, in the 'Annals & Magazine of Natural History,' ser. 8, vol. xiv. p. 17 (July 1914), states that the name *Rhegaster*, Sladen, 1883, has priority over *Poraniomorpha*, Danielssen & Koren, and should therefore be used if *Poraniomorpha*, *Rhegaster*, and *Lasiaster* constitute a single genus. This is an error. The genera date as follows:—

- (1) *Poraniomorpha*, Danielssen & Koren, "Fra den Norske Nordhavs-expedition," *Nyt. Mag. for Naturvidenskaberne*, vol. xxvi. 1880 (1881), p. 189. Type, *P. rosea*, monotypic.
- (2) *Rhegaster*, Sladen, *Trans. Roy. Soc. Edinburgh*, vol. xxxii. 1883, p. 155. Type, *R. murrayi*, Sladen, by designation ('Challenger' Asteroidea, 1889, p. 367).
- (3) *Lasiaster*, Sladen, 'Challenger' Asteroidea, 1889, p. 371. Type, *L. villosus*, monotypic.

In 'Asteroidea of the North Pacific,' 1911, p. 248, I used *Poraniomorpha* in the sense advocated by Dr. Grieg, to include *Rhegaster* and *Lasiaster*. I agree with Professor Verrill that it is better to include *Porania*, *Poraniomorpha*, and some of their allies in a family distinct from the Asteropidae—namely, in the Poraniidæ of Perrier.

Mediaster and *Nectria*.—Dr. Hubert Lyman Clark has

recently described, in an important paper* on Australian echinoderms a species called *Mediaster monacanthus* which he considers to stand between the Goniasterid genera *Mediaster* and *Nectria*. I have had the privilege of dissecting a specimen of this species, and it seems to me to belong unquestionably to *Nectria*.

In *Nectria* the gonads form 4 or 5 to 9 tufts attached to the dorsal integument in a line parallel to the margin of the ray. In *Nectria monacantha* these tufts are 4 or 5 in number on either side of each ray, and extend as far as the fourth superomarginal plate. In *Nectria ocellata* (Lamarck) the gonads form 9 tufts, beginning with two good-sized ones next to the rather solid interbrachial septum, and they extend in a series close to the superomarginals as far as the sixth superomarginal plate, or a trifle over one-third the length of ray measured on side. In *Mediaster* the gonads are in series, but do not extend so far as in *Nectria ocellata*. This distribution of the gonads is a good character to separate *Rosaster*, *Mediaster*, and *Nectria* from *Ceramaster* and *Nymphaster*.

Nectria may be distinguished from *Mediaster* by its calcified interbrachial septa (these being entirely membranous in *Mediaster*), by the conspicuously larger, fewer, more widely spaced, tabulate abactinal plates, and by the relatively large, triangular, papular areas of the disk, with upwards of 10 or even more (as high as 18 in *ocellata*) papulae. *Nectria* has supplementary internal actinal intermediate plates.

The intermarginal papulae which I described in 'North Pacific Asteroidea,' p. 164, in a species of *Nectria* from Victoria are not characteristic of all species, nor apparently of all specimens even, of *ocellata*, while in *ocellifera* they are absent. The subfamily Nectriinae, Perrier, which I resuscitated on the basis of these papulae, should therefore be discarded. If Verrill's subfamily Mediasterinae is recognized, it would seem that the older name of Perrier's should be used for it, because *Nectria* and *Mediaster* are so close.

Nymphaster, Sladen.—In his diagnosis of the genus in the "Narrative of the 'Challenger' Expedition," 1885, p. 612, Sladen mentioned no species, so that the genus really dates from 1889 ('Challenger' Asteroidea, p. 294). Here no type is designated. The following species are described:—*symbolicus*, *bipunctus*, *protentus*, *albidus*, *basilicus*. In 1899,

* "Report on the Sea-Lilies, Brittle-Stars, and Sea-Urchins obtained by the F.I.S. 'Endeavour' on the Coasts of Queensland, New South Wales, Tasmania, Victoria, South Australia, and Western Australia," 123 pp., 42 pls. Sydney, June 2, 1916.

Verrill* set aside *symbolicus* and *bipunctus* under the name *Nereidaster*, which is synonymous with *Rosaster*, Perrier, 1894. The type of *Nymphaster* must be chosen from the three remaining species, and for this purpose *Nymphaster protentus* is best adapted. It may therefore serve as the type of *Nymphaster*. The use of the name *Dorigona* for this group is, of course, quite indefensible, since *Dorigona* is a pure synonym of *Ogmaster*. Nor can the name *Nymphaster* be restricted to *symbolicus* and allies, as Dr. Kœhler suggested in 1910 †, since the species in question was made the type of *Nereidaster* in 1899.

Iconaster versus *Dorigona*.—In the paper on Australian echinoderms already referred to, Dr. H. L. Clark, on page 36, argues that the sea-star known as *Iconaster longimanus* (Möbius) should be called *Dorigona longimana* for the following reasons:—*Dorigona*, as diagnosed by Gray in 1866, included two species—*D. reevesii* and *D. longimana* (= *Astrogonium longimanum*, Möbius). The first species is held, without dissent, to be synonymous with *Goniodiscus capella*, Müller & Troschel, 1842, which in 1865 had been made the type of *Ogmaster* by von Martens. In 1889 Sladen made the second species—namely, *D. longimana*—the type of *Iconaster*. Dr. Clark states that Gray designated no type, and that since *D. reevesii* is invalidated by having been made, under another name, the type of *Ogmaster*, "*Dorigona longimana* (Möbius) must be the type of *Dorigona*, and I am quite unable to see why Sladen should have deliberately replaced Gray's name with one of his own coining—*Iconaster*. So far as I can see, *Iconaster* is a pure synonym of *Dorigona*, which is a monotypic genus with *Astrogonium longimanum* as its type."

Let me quote Gray's characteristically brief diagnosis ‡:—

"V. DORIGONA. Body depressed, 5-rayed, smooth; the dorsal and oral disk covered with many smooth, flat, polygonal squares; the marginal ossicles without any mobile spine.

"1. *Dorigona Reevesii* (t. 7. f. 3). Inhab. China or Japan; common in boxes of insects brought from China and Japan.

"See *a. Dorigona longimana* = *Astrogonium longimanum*, Möbius, *Abhandl.* iv. (1860) 7, t. 1. f. 5, 6."

* Trans. Connecticut Acad. vol. x. 1899, p. 186.

† 'An Account of the Shallow-water Asteroidea (Echinoderma of the Indian Museum),' Calcutta, 1910, p. 60.

‡ 'Synopsis of the Species of Starfish in the British Museum,' by John Edward Gray, 1866, p. 7.

The only species in the British Museum, and hence formally listed, is *D. reevesii*, which is automatically the type. The reference to *D. longimana* is casual, an "aside" such as Gray frequently indulged in—as, for example, on the same page under *Stellaster*. Here we find "1. *Stellaster Childreni*," followed by "See a. *Asterias equestris*, Retz. . . b. *Stellaster gracilis*, Möbius." We know that the first species is the type, since the genus was described, with only one species, in 1840. Gray naturally chose a species with which he was personally acquainted.

The following observations are pertinent in judging the merits of this case:—

1. A species doubtfully referred to a genus cannot subsequently be made its type, especially in place of a figured or described species upon which the generic name appears to be based (*D. reevesii*).

2. The first reviser of a genus cannot revise the genus before it is described. In other words, what von Martens in 1865 did with *Goniiodiscus capella* does not have a revisional effect on *Dorigona reevesii* (the same species) in 1866. Whoever comes after Gray must choose the type of *Dorigona* upon the data submitted by Gray, not upon what von Martens thought or did before Gray's genus was published. This answers Dr. Clark's statement that *D. reevesii* is invalidated for the type-species of *Dorigona* by having already been made the type of *Ogmaster*.

3. Since Sladen eliminated *D. longimana* by making it the type of *Iconaster*, he became the first reviser, and automatically fixed the type of *Dorigona* as *D. reevesii*. No one is at liberty to change this type. The type of *Dorigona* is *D. reevesii*, first, because it is the only species listed formally "without doubt," and, second, because the first reviser so fixed it by the simple process of removing the second species from the genus.

Dorigona is therefore a straight synonym of *Ogmaster*, and *Iconaster* is a tenable name for *Astrogonium longimanum*.

Dr. David Starr Jordan concurs in this view.

Lonchotaster and *Dipsacaster*.—Dr. H. L. Clark has recently described (*loc. cit.* p. 30) a large Astropectinid as *Lonchotaster magnificus*, which almost unquestionably belongs to *Dipsacaster* and is related to *D. imperialis*, Fisher (Philippines), *D. sladeni*, Alcock (Andaman Sea), and *D. grandissimus*, Goto (Japan). The type of *Lonchotaster* has never been fixed. The genus dates from Sladen, 'Challenger'

Asteroidea, 1889, p. 102, as the first diagnosis in the "Narrative of the 'Challenger' Expedition" (vol. i. p. 609) contained no specific names. The first species, and only adult form, is *L. tartareus*, and this may serve as type. The other species, *L. forcipifer*, seems to be founded upon immature, or, at least, very small specimens, and whether the adult is like *tartareus* or a species of *Dipsacaster* is not known. *L. tartareus* has a small spine on each marginal plate, rather small actinal interradiar areas, and seems to me to be near *Dylaster*. I have seen the type in the British Museum.

Metrodora, Gray, and its Systematic Position.—This puzzling genus was placed in the Linckiidae by Sladen ('Challenger' Asteroidea, 1889, p. 415), and other writers have followed him.

Metrodora shows an outward resemblance to the Asteropidae, barring the single feature of the slender rays. De Loriol* described a very young specimen as *Scaphaster humberti*, which he placed in the Gymnasteriidae (=Asteropidae) near *Asteropsis* (=Petricia, Gray).

Sladen (*loc. cit.*) stated that "its external facies and general structure appear to indicate an intermediate position between the Linckiidae and Echinasteridae."

Unfortunately the specimens at my disposal are small. The characters which would lead one to place this genus in the Asteropidae (restricted to *Asterope* and *Petricia*) are as follows:—The thin skin which covers the plates and spines; the conspicuous marginals, not unlike those of *Petricia*; the loosely tessellate abactinal skeleton, bearing skin-covered spinelets. The characters which are adverse, so to speak, are:—The conspicuous series of intermarginal plates, the absence of actinal intermediate plates, except a single plate back of the mouth-plates; the rudimentary interbrachial septum without a calcareous pillar (perhaps due to small size of disk); the single ampulla to each tube-foot.

The features which seem to ally *Metrodora* to the Echinasteridae are:—The single ampullae, spinose abactinal plates, and the adambulacral armature. The intermarginal plates and the very reduced actinal intermediate areas are entirely consistent with this family, but the very conspicuous marginal plates are not. The interbrachial septa are rudimentary, practically absent, although it is not possible in the small specimens at my disposal to be certain of this point.

* Mém. soc. phys. et d'hist. natur. Genève, vol. xxxiii. pt. 2, no. 1, p. 27.

Beyond a certain similarity due to the outward form, particularly to the slender rays, the Linckiidae have little claim to this genus.

The presence of intermarginal plates and of single ampullæ, and the absence of actinal intermediate plates, and of interbrachial septa with calcified pillar, will debar *Metrodora* from the Asteropidae, Ganeriidae, and Poraniidae, while additional differences in the abactinal skeleton make the last two families unsuitable homes.

Even the Echinasteridae appear to be incompatible. The abactinal plates of *Metrodora* are tessellated, not at all reticulate, while the marginal plates are large, compact, and form a vertical side to the ray. The interbrachial septa are almost lacking.

It seems better to place this genus in a separate family rather than to enlarge the Echinasteridae and, in a measure, spoil its homogeneity. The case of *Metrodora* is much like that of *Acanthaster*, *Mithrodia*, and *Valvaster*, which have at one time or another been in the Echinasteridae.

Metrodiridae, new family.

Characters.—Whole skeleton overlaid by a rather thin skin partially obscuring the outlines of the plates; rays slender; abactinal plates tessellate, partly imbricated, with small spines; marginal plates large, forming side-wall of ray, there being one or more series of intermarginal plates on the proximal part of ray; actinal intermediate plates reduced to one, between mouth-plates and intermarginals; papuke isolated, strictly abactinal; tube-feet with sucking-disk devoid of calcareous deposits; ampullæ single; interbrachial septa rudimentary, practically absent.

Priamaster, Koehler*.—This genus, founded on *Priamaster magnificus*, Koehler, is very close to *Gephyreaster*, Fisher †, type *Minaster swifti*, Fisher, North Pacific Ocean. *Priamaster* has much wider ambulacral furrows, quadriserial and very large tube-feet, and small actinal intermediate areas. The arrangement of spines on the mouth-plates of *Gephyreaster* is very characteristic, and is figured (*loc. cit.* pl. lvii. fig. 2). The abactinal paxilliform plates of *Priamaster*, the

* Zool. Anz., Feb. 13, 1912, p. 157; Deuxième Exp. Antarctique Française, Echinodermes, 1912, p. 91, pl. viii. figs. 1, 3, 8.

† Ann. & Mag. Nat. Hist. ser. 8, vol. v., Feb. 1910, p. 171; Asteroidea of the North Pacific etc., 1911, p. 175, pl. xxx. figs. 1-4, pl. lvii. figs. 2, 2 a-c, pl. lix. figs. 5, 5 a.

marginal plates, actinal intermediate armature, and especially the armature of the adambulacral plates, is very similar to that of *Gephyreaster*. Dr. Kœhler had much the difficulty in placing *Priamaster* in the system that I encountered in dealing with *Gephyreaster*. Both are related to *Radiaster*, Perrier (olim *Mimaster*, Sladen), and also, I think, more remotely to *Pseudarchaster*. Dr. Kœhler proposes a new family, "*Priamastéridées*." Professor Verrill has recently made *Mimaster*, Sladen (i. e., *Radiaster*, Perrier), the type of a family, the *Mimasteridæ* (= *Radiasteridæ*, Fisher). Whether *Gephyreaster* and *Priamaster* belong here or in a separate family, *Priamasteridæ*, I do not now feel at all certain. But, as something of a compromise, I would suggest placing them in a special subfamily, *Priamasterinæ*, under the *Radiasteridæ*.

XV.—*A new Genus and Subgenus of East-Indian Sea-Stars* *.

By WALTER K. FISHER, Stanford University, California.

THE following new genus is based upon a curious *Asterina*-like species from 206 fathoms, Buton Strait, Celebes, which will be figured, along with the other form herein described, in a report on the Asteroidea taken by the U.S. Fisheries steamer 'Albatross' in the Philippines, Celebes, and the Moluccas during her cruise of 1907-1910.

PARANEPANTHIA, gen. nov.

Characters.—Similar to *Asterina* in form, but with the adambulacral armature of *Nepanthia*; actinal intermediate plates in transverse series, and bearing a tuft of spinelets which becomes compressed and pectinate towards the margin of disk; bases of these spinelets webbed; abactinal plates imbricated, divided into two areas. On centre of disk and along a radial band they are rather crescentic, with a few small plates intermingled (usually placed adrad to the hollow of the crescent), while between this area and the ambitus the plates lack the crescentic form and are arranged in transverse series. Superficially the plates resemble low parapaxillæ, as they bear truncate groups of slender spinelets.

* Published with permission of the Commissioner of Fisheries.

Type of genus, *Nepanthia platydisca*, Fisher, Proc. U.S. Nat. Mus. vol. xlv. p. 214, Sept. 30, 1913.

This genus is distinguished from *Asterina*, in the wider sense, by the sharp differentiation of the plates of the centre of disk and the radial area from those of the lateral portion of the abactinal surface, by having an adambulacral armature of the *Nepanthia* type, though less extreme than that of *maculata*, and by the arrangement of the actinal intermediate plates, which are not in chevrons, in the ordinary sense, but form transverse series, separated by shallow grooves, proceeding from the adambulacrals to the ambitus. The first few series do not reach the ambitus, but end rather irregularly on the inner half of the interr radial line.

Paranepanthia probably includes *Nepanthia brachiata*, Koehler, a six-rayed species from the Andaman Islands.

The type of the following subgenus departs sufficiently from the type of its genus to warrant separation:—

GLYPHODISCUS, subgen. nov.

Characters.—Differing from *Iconaster*, Sladen, s. s., in having conspicuously elevated and rough superomarginal plates; a complete series of peripheral granules on the abactinal plates, which, moreover, are perfectly smooth, lacking the tiny blister-like bosses of *Iconaster*; a less compact adambulacral armature.

Type, *Iconaster perierctus*, Fisher ("Four new Genera and Fifty-eight new Species of Starfishes from the Philippine Islands, Celebes, and the Moluccas," Proc. U.S. Nat. Mus. xliii. p. 642, Feb. 5, 1913. Tawi Tawi Group, 97 fathoms).

XVI.—*Remarks on the Midwife Toad (Alytes obstetricans), with reference to Dr. P. Kammerer's Publications* *. By G. A. BOULENGER, F.R.S.

HAVING recently felt bound to recommend caution in accepting the results of the experiments conducted in Vienna by Dr. Kammerer within the last fifteen years, and to express

* 1. "Experimentelle Veränderung der Fortpflanzungstätigkeit bei Geburtshelferkröte (*Alytes obstetricans*) und Laubfrosch (*Hyla arborea*)," Arch. f. Entwicklmech. xxii. 1906, p. 48.

2. "Vererbung erzwungener Fortpflanzungsanpassungen.—Die Nach-

doubts as to certain alleged facts which it seems almost impossible to control, I now propose to contrast some of that author's statements on the breeding-habits of *Alytes* with my own observations on this remarkable batrachian, of which I think I may claim to have some experience. There are so many points in Kammerer's accounts which conflict with what I have myself repeatedly observed that it may be well to draw attention to some at least, and to submit them to the consideration of biologists who might wish to form their own opinion, such cases being selected as may be tested without spending years in experiments—a condition which, as in the well-known instance of the spotted salamander, must surely deter almost anyone from attempting to take up the subject.

Kammerer has already observed, in reply to criticisms, that specimens compelled to behave under highly abnormal conditions, such as he has devised, and such as very few will ever have the skill and patience or find the time to repeat, cannot be expected to conform to the rule in the natural state; but I think most of the discrepancies I have pointed out in this paper do not admit of such an explanation. The facts on which I rely are derived from observations made in France and in Belgium, but I cannot believe for a moment that Westphalian and Swiss specimens, on which Kammerer's statements are based, should have habits so different as to account for these discrepancies.

From the days of Demours*, who first observed part of the parturition of the midwife toad, and gave a very incomplete and incorrect account of the operation, up to Kammerer's observations, only A. de l'Isle†, whom I have been able to confirm on all important points‡, and Héron Royer§ have described this complicated and wonderful act without recourse

kommen der nicht Brutpflegenden *Alytes obstetricans*," *op. cit.* xxviii. 1909, p. 447.

3. 'Die Abstammungslehre' (Jena, 1911), p. 93.

4. "Mendelsche Regen und Vererbung erworbener Eigenschaften," *Verh. Naturf. Ver. Brünn*, xlix. 1911, p. 73.

5. "Bemerkungen zum Laichgeschäft und der Brutpflege bei der Geburtshelferkröte," *Bl. Aq. Terr. K.* xxv. 1914, p. 250.

These contributions are referred to under the above numbers.

* *Hist. Ac. Sc.* 1741, p. 28, and *Mém. Ac. Sc.* 1778, p. 13.

† *Ann. Sc. Nat.* (3) xx. 1876, no. 7.

‡ *Bull. Ac. Belg.* 1912, p. 570, pl. —. Since the publication of this paper I have observed the breeding of *Alytes* four times, from beginning to end.

§ *Bull. Soc. Zool. France*, xi. 1886, p. 675.

to the imagination, which has evidently played greater or less a part in the very numerous other accounts which have appeared and to which I need not refer here. As to Kammerer himself, I feel sure he has never once carefully observed the whole operation, otherwise he would certainly have thought it worth while to allude in some way to the discrepancies between his own observations and those of de l'Isle. By not endeavouring to unravel the truth through checking the latter's account he has laid himself open to the reproach made by Spallanzani to Demours:—"Une observation si intéressante méritait bien d'être répétée, et elle me paraissait plus propre à irriter la curiosité du philosophe qu'à la satisfaire."

Close upon forty-five years' experience has shown me that, in the adult condition, males of all European Discoglossids, Pelobatids, Hylids, and Bufonids are much more numerous than females. This anyone can test by collecting specimens or by ordering large numbers from dealers who do not discriminate between the sexes.

The fact has long been known. I will quote the words of a herpetologist for whom I have a great respect and whose experience was, at the time he wrote, unsurpassed:—

"Je tiens à signaler un fait que tous les herpétologues ont pu vérifier dans leurs excursions, mais que je ne trouve consigné nulle part : c'est le très petit nombre des femelles, par rapport à celui des mâles, chez tous les Batraciens anoures. Une proportion exacte serait difficile à établir, et d'ailleurs je n'en vois pas bien l'utilité. Je me bornerai ici à exposer quelques chiffres. Le 22 Février (1877), une excursion aux environs de Bordeaux me rapportait 49 anoures adultes, appartenant aux espèces *Bufo vulgaris*, *B. calamita*, *Rana agilis*, *Pelodytes punctatus*, *Hyla viridis*. Sur ces 49 individus, il y avait seulement 3 femelles. Dans toutes les excursions que j'ai faites ce printemps, jusqu'au 9 Avril, dans la Gironde, j'ai recueilli environ 150 *Pelodytes*, 90 *Pelobates* cultripèdes et 80 Rainettes; et sur ces chiffres il y avait environ 20 femelles pour la première espèce, une douzaine pour la seconde, 10 pour la troisième. Quant aux Calamites, je rejetais les mâles pour ne recueillir que les femelles. Or, pour 7 ou 8 de ces dernières que j'ai pu prendre, j'estime bien à 150 le nombre des individus que j'ai examinés. Et j'ai toujours observé une semblable disproportion dans mes excursions diurnes comme nocturnes, et soit que je m'emparasse des batraciens à l'eau, soit que je les prisse chez eux, en les déterrants" (F. Lataste, Bull. Soc. Zool. France, 1877, p. 270).

And further (*t. c.* p. 281), alluding to *Alytes*, "Les mâles sont, chez cette espèce comme chez les autres, bien plus nombreux que les femelles."

I know that contradictory statements on this subject have been made, by Leydig among others, but I can only say that my experience coincides entirely with Lataste's*, and particularly in the case of *Alytes*, of which I have come across hundreds of specimens in France and in Belgium†. This is corroborated by the fact, which anyone may verify, that if, in spring or early summer, a large number are caught at random in the open or pulled out of their retreats, a much greater proportion of males without eggs will be found than of nursing individuals, notwithstanding the well-known ability of the male to attend to two or even three females in succession.

It is therefore surprising to me that Kammerer (4, pp. 101-104), in his Mendelian experiments, should find an equal or not very unequal number of mature individuals of either sex:—

1st generation:	29	reared to the adult condition,	12 ♂, 17 ♀.
2nd "	44	" " "	22 " 22 "
3rd "	72	" " "	43 " 29 "

At the outset of his experiments he operated on a number of specimens sent to him by Dr. C. Hartmann, a dentist in Munster, Westphalia, and this lot consisted of 14 males and 21 females (1, p. 69; 2, p. 455), a remarkable fact considering that Hartmann himself‡ says that he is unable to distinguish surely the sexes externally; the explanation may be, however, that the largest specimens were chosen in preference. A further surprising statement (1, p. 69; 2, p. 454) in connection with the Hartmann specimens is that all the males should have bred three nights after their

* As Lataste has not mentioned *Bombinator*, I may add that, out of five small series of *B. pachypus* in the British Museum from France, Italy, Roumania, and Greece, collected at random, there are 26 males and only 7 females. I do not mention other series of the same species in the Museum because, collected by myself, they are to be considered as a selection in which the sexes have not been overlooked.

† Just after writing these lines I have received (June 21) six *Alytes* collected without discrimination of the sexes in a garden in Bedford, where they have established themselves for some years, and five are males, two carrying eggs.

‡ 'Natural Science,' viii. 1896, p. 394. Also an article in 'Natur und Haas,' reproduced in Brehm's 'Tierleben,' 4th ed. (1912), i. p. 193.

arrival (April 21). On many occasions Kammerer has appealed to the highly perfected installation of his terrarium * to account for the marvellous way in which breeding experiments succeed under his care, and I am quite ready to concede him this point to some extent; but he surely cannot make such a claim in this case. Knowing by experience how *Alytes* behaves under the circumstances, I cannot imagine this shy and highly impressionable batrachian, which, in common with many others, is able to withhold parturition, setting down to breed with such promptitude after a long journey. Considering the protracted breeding-season of the species (usually from April to August, each female ovipositing two or three times), how can as many females as there were males have been ready to lay almost at the same time?

De l'Isle was, as I have said before, the first to give a full and true account of the breeding operations in Brittany, which, having been so fortunate as to witness several times myself in Belgium, I have verified in all essential points, whilst I cannot confirm Hartmann's and Kammerer's statements. Is it possible to think that specimens from Westphalia and Switzerland should behave in a manner so different? The Zoological Society received some years ago a number of Westphalian *Alytes* purchased from the same Dr. Hartmann. Contrary to what happened when sent to Kammerer, they did not breed with us; but I saw them at the time, and they did not strike me as in any way different from the French and Belgian. Yet Kammerer's account of the manner in which the eggs are laid differs entirely from what de l'Isle has witnessed twenty-three times, Héron Royer once, and I seven times. Nowhere can I find a circumstantiated note of Kammerer's observations on the breeding, or how many times he has seen it, or on how many occasions he has spent part of the night at the Versuchsanstalt—the latter a subject worth enquiring into, considering that Kammerer tells us himself † that he does not reside at the Versuchsanstalt, but at Hütteldorf, two miles from Vienna, whilst the extent of his multifarious experiments on salamanders, *Proteus*, *Alytes*, *Hyla*, &c., would, it seems to me, have required his almost constant watch, especially after

* In using the term in the singular, I do not mean to convey the idea that Kammerer keeps all his batrachians in a single case, any more than when speaking of an aquarium I have in mind a single tank.

† Arch. Entwicklmech. xxxvi. 1913, p. 168.

sunset, during the spring and summer. Salamanders and *Alytes* never pair in the daytime.

I should have thought that de l'Isle's publication had disposed once for all of the old story, which originated with Demours, that the male pulls out the strings of eggs from the female and thus performs obstetric functions. As de l'Isle has told us, the ova are expelled suddenly, in a second or two, forming a ball-like mass, between the extended hind limbs of the couple, and the male does not attempt to disentangle the strings until after about ten minutes' rest. Yet here are Kammerer's own words, taken from his first paper (1, p. 53):—

“Das Männchen umarmt sein Weibchen um die Lenden und presst ihm die Laichmasse, die aus auffallend grossen Eiern besteht, heraus, wobei es mit den Hinterbeinen nachhilft, indem sie die Laichmasse eintauchen und diese durch abwechselnde Anziehen und Ausstrecken aus der weiblichen Cloake hervorziehen.”

If the reader will refer to the accounts of the parturition given by de l'Isle and myself, he will see that there are two quite distinct phases in this operation—the first, ending with the extrusion of the eggs, up to which moment the male clasps the female at the waist (“Lenden”), the second, during which the female is clung to at the neck whilst the male proceeds with the fertilization and the movements of the hind limbs by means of which the strings of eggs become entwined round them. The “Anziehen und Ausstrecken” cannot coincide with the lumbar amplexation; this would be, as de l'Isle has observed, a material impossibility, for the eggs would be under the male instead of behind it, and could not be managed in the lading operations.

My conclusion is that Kammerer can only have had glimpses at the act of parturition, either before the publication of his first paper or after, as his latest version (4, p. 97) is as follows:—

“Sie legt nur 18–83 verhältnissmässig sehr grosse, weil dotterreiche Eier, deren Gallerthülle sich zu einer Schnur verbindet, auf dem Lande ab, wo die Gallerthülle nicht quellen kann. Das väterliche Tier leistet seinem Weibchen *Geburtshülfe*, indem es ihm die Eierschnur aus der Kloake zieht.”

A little further (4, p. 97) Kammerer goes on to say, referring to oviposition in water:—

“In dem Augenblicke aber, als die Gallerthülle jetzt mit Wasser in Berührung tritt, quellt sie auf, verliert dadurch ihre

Klebrigkeit und selbstredend ihre Eigenschaft, sich später beim Eintrocknen, welches hier nicht statthat, um die Schenkel des Männchens fest zusammenzuziehen; macht es also unmöglich die Laichschnur auf seinen Hintergliedmassen zu befestigen. Die Laichschnur bleibt deshalb im Wasser liegen, wo sich trotzdem etliche Eier zu entwickeln vermögen."

It is thus stated that normally, on land, there is no swelling out, rather a desiccation, of the egg-capsules, which helps the male to fasten the strings round its legs, whilst such a swelling of the same capsules takes place after a few minutes immersion that it becomes impossible for it to do so.

My experience is contrary to both these statements. During the act of fecundation the eggs receive a considerable amount of soaking through a copious discharge of liquid from the male's bladder. I have seen the ground quite wet below the eggs, and the capsules, instead of shrinking, swell out to a slight extent, measuring 3 to 4 mm. in diameter when the pair separate. On the other hand, I have found eggs which shortly after having been laid were placed in water for about two hours to measure 4 to 5 mm. The toughness and viscosity of the capsules are preserved, and there should be no obstacle to the male in very shallow water dealing with the eggs in the normal way if it felt so disposed.

The notion that water affects the egg-envelopes to the extent mentioned by Kammerer, who represents the water-eggs of the later generations as 10 mm. in diameter (2, pl. xvi. fig. 2), is surely contrary to analogy in the case of other batrachians, such as *Pipa* and the *Urodeles*. In the former, which is thoroughly aquatic, and of course spawns in the water, the eggs are much of the same kind as those of normal *Alytes*, and it is a well-established fact that they stick to the back of the female after oviposition. Among the aquatic forms of the latter we find feebly swollen and viscous capsules, adhering readily to weeds or stones, in our common English newts, and others which swell out to the same extent as in the typical frogs, such being the *Pleurodeles* newt and the *Amblystomes*. I therefore refuse to believe that the mere fact of being laid in water can transform the eggs, as is stated to happen in *Alytes*, and I may add that the high temperature of 25-30° C. (4, p. 97) has recently been shown* not necessarily to prevent it from breeding in the normal way.

But the amusing thing is that, after having been assured (4, p. 97) that it is "unmöglich" for the strings of eggs to

* Dähne, Bl. Aq. Terr. K. xxv. 1914, p. 229.

become attached to the hind limbs of the males after they have been a few minutes in water, which is absurd, we are told a few pages further (4, p. 101), when the feat is required for the sake of establishing the Mendelian segregation, that it can be done:—"Die Schnur enthielt die für *Alytes* enorme Menge von 112 solcher Eier. Es zeigte sich, dass sie, die ja eigentlich für Wasser bestimmt waren (wo die Kopulation auch stattgefunden hatte, aber das Männchen war sogleich mit seiner Bürde herausgeklettert), tatsächlich in der Luft nicht mehr so gut fort kamen."

A further remark concerning the desiccation of the egg-capsules, which is stated to take place when the eggs are nursed on land. I have observed two cases of males already laden taking charge of a second burden, and in the operation the strings of the first brood, at least a day or two old, stretched out with the same facility as the others.

Now as to the oviposition and development in water. This is what we are told (1, p. 70) happened in the case of some specimens received from Westphalia in April 1905:—"Die herausbeförderten Eierschnüre lagen dann . . . im Wasserbecken. Ich überraschte die Tiere auch etliche Male*, wie sie hier die Copulation vollzogen. Das Wasserbecken war nur drei Zentimeter hoch angefüllt, so dass sie nicht, wie es z. B. die Frösche in der Natur freiwillig tun, während der Begattung zu schwimmen brauchten. Der Vorgang stimmte, was Stellungen und Bewegungen anbetrifft, gut mit der genauen Beschreibung de l'Isle's überein, nur aber, wie bemerkt, mit der wesentlichen Abweichung, dass hier kein Aufladen der Eier seitens des Männchens stattfand, sondern dass die dicke, aus zwei miteinander verschmolzenen Schnüren entstandene Laichmasse ohne weiteres liegen blieb." And these eggs laid in the water developed quite well, and much quicker than those on land (1, p. 75):—"Schon nach 13 bis 15 Tagen, vom Tag der Besamung an gerechnet, schwärmen aus den im Wasser liegenden *Alytes*-Eiern die Larven hervor."

I could hardly, at the time I first read it, believe such a statement, having, as have others, repeatedly tried to rear *Alytes* eggs in water, but without success. In order to satisfy myself once more, I made a further experiment in Belgium in 1912, under what I thought the best conditions, bearing in mind what Kammerer had written, taking the eggs from

* *A few times* is strange, considering that there were only fourteen males altogether, two of which took charge of eggs (see above, p. 176), whilst other broods lay scattered "überall im Behälter herum," on the earth, above and under moss, sticking to stones, or in the water.

males immediately after they had been fertilized, and placing them in water drawn from the little pond in which they would have ultimately hatched had they been left to the care of the parent; but development stopped on the fifth or sixth day, at the period when the embryo produces its external gills. I may add that the eggs so treated did not show the extraordinary "Aufquellen der Gallerthülle, genau wie dies bei anderen Anuren-Eiern der Fall ist" (1, p. 74).

I fully expected some reason would be forthcoming on the part of Kammerer to explain the failure of my experiment, and so it was; but I should never have thought him capable of making a new statement so contrary to the plain wording of the sentence quoted above, which is to the effect that, after lying thirteen to fifteen days in water 3 cm. deep, no manipulations being mentioned, the larvæ (all or most of them, as anyone would understand) swarmed out ("schwärmten aus") of the egg-capsules. I was therefore, I think, fully justified in saying * "Il en serait autrement des *Alytes* de Westphalie, appartenant pourtant à la même espèce, puisque Kammerer, opérant avec ceux-ci, ne semble avoir aucune difficulté à contrarier ainsi l'ordre de la nature."

Now this is what Kammerer, replying to my criticism, tells us (5, p. 260) really happened on that occasion:—

"Junge *Alytes*-Eier befinden sich, unter Wasser liegend, an sich schon nicht unter 'natürlichen' Bedingungen, und, um diese zu kompensieren bedarf es ebenso 'unnatürlicher' Gegenbedingungen in peinlicher Sterilhaltung des Laiches: in ausgekochtem, dann künstlich durchlüftetem Wasser. Trotzdem dringen noch Schimmelkeime ein, und jedes befallene Ei muss sorgfältig entfernt werden. Bei Einhaltung dieser Vorsichtsmaßnahmen mussten immerhin zahlreichere Eiballen abgestorben in den Kübel wandern, als Herr Boulenger wohl sie zu seinen Versuchen verwendet hat, bis ich endlich an einigen wenigen Eier einiger weniger Eierballen mit der submersen Entwicklung Glück hatte."

Why, it may be asked, was all this not mentioned at first, instead of letting the reader believe that the embryos underwent the whole of their development without any intervention on the part of the experimentator.

From this sample of the levity with which Kammerer relates his experiments, is it surprising if some of his statements should be challenged by those who, like myself, do not place implicit confidence in them?

* Bull. Ac. Belg. 1912, p. 579.

There is another criticism—one of the most important—which Kammerer has not yet answered.

Having bred the "water-form" to a fourth generation, this is what he claims to have observed :—

"Es zeigt sich aber an den geschlechtsreifen Männchen vierter Generation eine weitere morphologische Variation . . . waren die brünnlich gewordenen Männchen alle mit schwarzen verfärbten Schwielen an der Oberseite des Daumens und am Daumenballen versehen und ebenso zeigt sich an ihnen eine Hypertrophie der Vorderarmmuskulatur" (2, p. 516, fig. 26).

When I first saw the figure of the male *Alytes* with black nuptial callosities on the "Daumen" or inner finger I concluded that such a disposition was highly improbable, if not impossible, basing my opinion on the small size and the shape of this finger in normal individuals, and I have since satisfied myself, by handling a pair *in amplexu*, that, if callosities should ever develop on the fingers, they would be on the two inner fingers, both being in contact with the inguinal region of the female—a correlation to which I know of no exception. It is true that Kammerer appears to have been under the erroneous impression that the thumb alone plays a rôle in the amplexus in all European Anura :—
"Bekanntlich steigt das Anurenmännchen seinem Weibchen auf den Rücken und umklammert es, indem es seine Daumen bald in die Lenden bald in die Achselgrube des Weibchens einstemmt" (4, p. 100).

As I told Prof. Bateson at the time, if a specimen such as is figured could be produced, I would cease to doubt any of Kammerer's statements. This is how the matter now stands, according to Bateson * :—

"Regarding the *Alytes* bred in this way" [alleged atavistic reversion to aquatic breeding-habits] "Kammerer makes the very striking statement *that the males in the third generation have roughened swellings on their thumbs and that in the fourth generation these swellings develop black pigment*. Together with the appearance of this secondary sexual character there is hypertrophy of the muscles of the fore arm. To my mind this is the critical observation. If it can be substantiated it would go far towards proving Kammerer's case. *Alytes*, among toads and frogs, is peculiar in that the males do not develop these lumps in the breeding-season, and the fact may no doubt be taken to be correlated with the breeding-habits, copulation occurring on land, and not in

* 'Problems of Genetics' (New Haven and London, 1913), p. 201.

water as is usual with batrachians. It is to be expressly noticed that these lumps on the thumbs or arms of male toads and frogs are not merely pigmented swellings, but are pads bearing numerous minute horny black spines, which are used in holding the female in the water. The figures which Kammerer gives are quite inadequate, and as they merely indicate a dark patch on the thumbs it is not possible to form any opinion as to the nature of the structure they represent.

"The systematists who have made a special study of Batrachia appear to be agreed that *Alytes* in nature does not have these structures; and when individuals possessing them can be produced for inspection it will, I think, be time to examine the evidence for the inheritance of acquired characters more seriously. I wrote to Dr. Kammerer in July 1910, asking him for the loan of such a specimen*, and on visiting the Biologische Versuchsanstalt in September of the same year I made the same request; but hitherto none has been produced. In matters of this kind much generally depends on interpretations made at the time of observation; here, however, is an example which could readily be attested by preserved material. I notice with some surprise that in a later publication [Kammerer, 4] on the same subject no reference to the development of these structures is made. As these would be of special value in such a diagnosis, the omission of any allusion to them calls for explanation. Kammerer claims the evidence as proof of Mendelian segregation in regard to an acquired character, the first example recorded. Pending a repetition of the experiment, there is no more to be said."

A last remark. Kammerer takes it for granted that the aquatic parturition, resulting in a strong reduction in the size of the vitelline sphere, such as he claims to have artificially induced in *Alytes*, is a case of atavistic reversion (1, p. 70; 4, pp. 96, 105). Has he given sufficient thought to this important question? Is he aware of how great a number of batrachians, not necessarily with direct development and quite irrespective of their systematic position, produce eggs with large vitellus, so that, when our knowledge of tropical forms is more advanced, such a type of eggs may no longer have to

* "In reply to my letter, Dr. Kammerer, who was then away from home, very kindly replied that he was not quite sure whether he had killed specimens of *Alytes* with '*Brutfischweilen*' or whether he only had living males of the fourth generation, but that he would send illustrative material."

be regarded as the great exception among *Anura* taken as a whole?

If it be permissible to speculate on the phylogeny of *Alytes*, I would suggest that it is the large size of the eggs that has enabled its direct ancestors to take to oviposition on land, and not that the character of the eggs has been modified to that effect*. I have already expressed the opinion†, based on the assumption that batrachians were derived from fishes related to the Crossopterygians and Dipnoans, which produce eggs of a type similar to those of *Cryptobranchus* and *Alytes*, viz., intermediate between the meroblastic and holoblastic, that *Bufo* (extreme reduction of the food-yolk) and *Hylodes* (suppression of the larval life) are extreme and divergent examples evolved out of a condition such as we still find in the thoroughly aquatic Urodeles *Cryptobranchus* and *Megalobatrachus*.

XVII.—*On a Second Species of the Batrachian Genus Amphodus.* By G. A. BOULENGER, F.R.S.

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THE remarkable genus *Amphodus* was proposed by Peters ‡ for a small tree-frog from Bahia which, being provided with teeth in the lower jaw and having cylindrical diapophyses to the sacral vertebræ, has been referred to the family Hemiphractidæ, from the other genera of which it is separated by the presence of teeth on the parasphenoid. Peters suggested at the time that his *Amphodus wuchereri* might be closely related to, if not the same as, *Hyla luteola*, described by Wied from specimens observed on the east coast of Brazil living mostly between the leaves of Bromelias.

I am now able to add a second species to the genus, which was previously only known to me from the description and figure. This species is so near to *A. wuchereri* that when

* As one might feel inclined to adduce, in opposition to my argument, the case of the Solomon Islands frogs, which, deprived of suitable water for larval existence, dispense with the metamorphoses, I may mention that I have recently described a frog from Siam—*Rana pileata*—which in all probability breeds in water, the female of which measures 52 mm. in length and the uterine eggs 3 mm. in diameter, exactly as in *Alytes obstetricans*.

† 'Les Batraciens' (Paris, 1910), p. 49.

‡ Mon. Berl. Ac. 1872, p. 768.

Mr. R. R. Mole submitted to me three specimens obtained from Bromelias in Trinidad by his friend Capt. F. W. Urich, I at once thought of *Amphodus*, and this guess at the genus was confirmed on opening the mouth of the frog, which showed large widely spaced teeth in the lower jaw, decreasing in size from the symphysis, and small teeth on the parasphenoid bone. This little frog, measuring only 32 mm. from snout to vent, is specifically different from *A. wuchereri*, the tympanum being completely hidden; but as it agrees tolerably well with the rather unsatisfactory description and figure of *Hyla aurata*, Wied *, from Bahia, stated to live in the same surroundings as *H. luteola*, I am disposed to refer it, provisionally at least, to the species so named, on account of the golden-yellow colour of the three stripes on the back. Should, however, *Hyla aurata*, Wied, prove to be a *Hyla*, the name *Amphodus auratus*, Blgr., would nevertheless stand for the Trinidad frog.

Capt. Urich intends to give an account of the habits of this frog, as observed by him, and in the meantime he has requested me to draw up a definition of the species.

Amphodus auratus.

Head much depressed, a little broader than long; snout truncate, as long as the orbit, with distinct canthus and nearly vertical loreal region; nostril near the tip of the snout; interorbital space broader than the upper eyelid; tympanum hidden; a strong ridge above the temple. Fingers and toes moderately long, the tips dilated into well-developed disks, the subarticular tubercles very feeble; fingers free, first shorter than second; toes slightly webbed at the base. The tibio-tarsal articulation reaches the eye; tibia half the length of head and body, longer than the foot. Skin smooth, coarsely granular on the belly and under the thighs. Brown above, with three golden-yellow longitudinal streaks on the back, the outer bifurcating on the head, the branches ending between and behind the upper eyelids; or head yellow, with brown spots and three brown streaks, the outer following the canthus rostralis and the supratemporal ridge.

The three specimens described were obtained on Mount Tucutche, a little above 3000 feet altitude.

* Reise Bras. ii. p. 249 (1821), Naturg. Bras. i. p. 531 (1825), and Abbild. pl. —. fig. 3 (1831).

XVIII.—*Descriptions of some Ethiopian and Australian Homoptera.* By W. L. DISTANT.

Fam. Fulgoridæ.

Subfam. TETTIGOMETRINÆ.

Hilda welwitschi, sp. n.

Vertex of head and pronotum pale dull ochraceous, posterior margin of pronotum paler; scutellum dull castaneous brown, its extreme apex pale dull ochraceous; face pale ochraceous, with a curved transverse testaceous fascia between the eyes; body beneath and legs more or less ochraceous, femora castaneous, tibiæ and tarsi spotted with fuscous brown; tegmina dull pale violaceous, the claval area virescent, margined inwardly and outwardly with pale purplish brown, three irregularly transverse, more or less broken, greyish linear fasciæ—one near base (outside claval area), one near middle, the third (much angulated) near apex, some small darker spots on costal margin; vertex of head concavely excavate, almost as long as broad; scutellum moderately convex, antennæ black.

Long., incl. tegm., 5 mm.

Hab. Angola (*Dr. Welwitsch*).

TEMBANDUMBA, gen. nov.

Vertex of head longer than breadth between eyes, more or less triangular, acutely narrowed anteriorly, discally foveately, laminately depressed, eyes at bases of lateral margins, basal margin truncate; face almost as broad as long, centrally carinate for about half its length, medially depressed; clypeus about as broad as long, moderately convex; antennæ passing eyes, robust; pronotum much shorter than vertex, basal margin truncate but centrally slightly sinuate, laterally subangulate, centrally longitudinally carinate; scutellum large, convex, almost as broad at base as long, the apex a little acutely longitudinally produced; tegmina about twice as broad as long, costal margin a little depressed near middle, apices subconically rounded; legs somewhat short and strong; posterior tibiæ unarmed.

Allied to the genus *Hilda*, Kirk (n. nom.), incl. *Isthmia*, Walk., and *Egropa*, Melich.

Tembandumba buarana, sp. n.

Vertex of head, pronotum, and scutellum dark ochraceous; lateral margins of pronotum (narrowly), narrow margins of scutellum, and a large angulated spot at each basal angle black; face ochraceous; clypeus black; sternum and legs black; coxæ and trochanters ochraceous; abdomen beneath pale sanguineous or ochraceous; tegmina sanguineous; outer and inner margins (narrowly), anterior claval margin (broadly), claval apex, two broad transverse fasciæ extending from inner claval margin to costal margin, and the apical marginal area shining black; two spots in claval area, one about middle of inner claval margin, and the other preceding and attached to the apical claval spot, the anterior margins of the two black transverse fasciæ to tegmina, and a small costal spot at inner margin of the black apical area creamy white; other structural characters as in generic diagnosis.

Long., incl. tegm., 8-9 mm.

Hab. W. Africa; Cameroons, Buar.

Subfam. *EURYBRACHYDINÆ*.*Dardus erebus*, sp. n.

Black; tegmina with a prominent transverse, slightly oblique, pale ochraceous or greyish-white spot before middle of costal area; vertex of head broad, short, very slightly concavely depressed on anterior margin, a central dull castaneous ridge and a slight foveation before each eye; pronotum with the lateral areas of the anterior margin and three discal carinations—one central and straight, the other two oblique—dull castaneous; scutellum pale dull castaneous; tegmina with the venation very obscurely dull castaneous; abdomen beneath sanguineous; posterior tibiæ more or less brownish ochraceous.

Long., incl. tegm., $5\frac{1}{2}$ -6 mm.

Hab. Australia; Queensland; Moreton Bay (Brit. Mus.). New South Wales; Leura (*Froggatt*).

Subfam. *RICANINÆ*.*Privesa pronotalis*, sp. n.

Head, pronotum, and scutellum pale ochraceous, with small, somewhat obscure, darker mottlings; pronotum with a large spot occupying each lateral area and sometimes the anterior margin black; scutellum with a small black spot near each basal angle; abdomen above brownish olivaceous,

the basal segment greyish or very pale ochraceous; body beneath and legs pale ochraceous, with some very small and obscure darker mottlings, those on the face sometimes forming a dark central spot; facial lateral marginal areas with a series of small dark spots; tegmina pale dull ochraceous, with dark mottlings, of which the largest are on the apical halves of costal areas, many of the discal longitudinal veins prominently blackish; wings subhyaline, the venation pale ochraceous; head (including eyes) about as broad as pronotum, anterior margin slightly rounded in front of eyes, and with a transverse subconvex ridge between eyes, and a central longitudinal carination, on posterior area two small subexcavate dark spots.

Long., excl. tegm., $4\frac{1}{2}$ – $5\frac{1}{2}$ mm.; exp. tegm. 13–16 mm.

Hab. New South Wales; Hay (*J. Little*). On salt-bush.

Fam. Jassidæ.

Eurymeloides moruyana, sp. n.

Vertex of head and pronotum bronzy brown; eyes dull ochraceous; face and body beneath black; legs dark castaneous; scutellum and tegmina shining black, the latter with a small cluster of greyish-white spots near apex of costal area; vertex of head roundly, a little subangularly produced, thickly punctate; pronotum transversely, a little obliquely striate, with two small dark central foveæ on anterior margin; scutellum finely punctate on basal half, after which it is suddenly depressed to apex and is finely transversely striate; posterior tibiæ shortly coarsely spinose.

Long., incl. tegm., 7 mm.

Hab. Australia; New South Wales, Moruya (*Murray*).

Subfam. LEDRINÆ.

Ledropsis crocina, sp. n.

Vertex of head ochraceous mottled with testaceous; pronotum paler ochraceous mottled with testaceous, which on disk forms a more or less complete central longitudinal fascia and two spots near basal margin; scutellum ochraceous; body beneath and legs ochraceous, marginal areas of head beneath before eyes more or less testaceous, margins of face distinctly darker, tibiæ and tarsi spotted and marked with sanguineous; tegmina ochraceous, more or less suffused with purplish brown and irregularly but somewhat thickly spotted with greyish white; vertex of head longer than pronotum, apically conically rounded and moderately upturned,

centrally longitudinally carinate, and from the latitude of eyes a shorter carination on each side of central one, the whole of its surface more or less rugose, facial area strongly concave; pronotum declivous, moderately gibbous at base.

Long., incl. tegm., 12 mm.

Hab. New South Wales; Tamworth (*Lea*).

Allied to *L. froggatti*, Dist., but vertex of head apically broader and less acuminate, tegmina palely spotted, &c.

Ledropsis acuminata, sp. n.

Head, pronotum, scutellum, body beneath, and legs more or less fuscous brown; tibiae obscurely palely annulated; tegmina dull pale greyish brown, the venation, basal area, and three or four spots in oblique series before middle fuscous brown; basal margin of pronotum black; vertex of head much longer than pronotum, very strongly, centrally, longitudinally carinate, on each side of which it is very declivous, near middle it distinctly narrows to apex, which is acute; pronotum centrally longitudinally carinate; scutellum coarsely tricarinate.

Long., incl. tegm., 14 mm.

Hab. Queensland; Gayndah (*Godeffroy Exped.*).

A very distinct species by the long and apically acute vertex of the head.

GUDWANA, gen. nov.

Vertex of head (in type) about as long as broad, above centrally longitudinally carinate, and in general as in *Ledropsis*; head beneath concave, face narrow, a little raised, and margined on each side by prominent and robust longitudinal ridges; pronotum with the basal area gibbous and armed on each side with a very robust spine directed obliquely upwards, the basal margin concave; tegmina about three times longer than broad, not quite passing the abdominal apex; legs robust.

Allied to *Ledropsis*, but differing principally by the long and robustly spined pronotum.

Gudwana typica, sp. n.

Head, pronotum, scutellum, and body beneath ochraceous; tegmina and legs pale ochraceous; face between eyes centrally longitudinally black; apices of the pronotal lateral spines castaneous; tegmina with three pale ochraceous linear spots on veins above the middle of claval area; vertex of head and

the pronotum thickly and somewhat coarsely punctate, the pronotal basal spines robust, obliquely upwardly raised, their apices slightly recurved and subacute; scutellum thickly punctate; tegmina finely wrinkled and punctate, the veins somewhat prominent.

Long., incl. tegm., 13 mm.; exp. pronot. angl. 4 mm.

Hab. New South Wales; Sydney.

Subfam. *TETTIGONIELLINÆ*.

Tettigoniella nigrifrons, sp. n.

Vertex of head pale greenish yellow, a small spot at apex, a large marginal spot on each side before middle, a central transverse fascia which is medially maculate and centrally connected with base, and a central median basal line black; face wholly black, with a small semicircular ochraceous fascia on middle of anterior margin; clypeus pale ochraceous, with a dark central longitudinal fascia; pronotum olivaceous green, its anterior area pale greenish yellow, with three central black longitudinal lines, transversely connected before reaching anterior margin, and a small oblique black spot on each lateral margin; scutellum pale ochraceous, the basal angles, lateral margins, and a narrow transverse central line connected with a medial spot black; legs pale ochraceous; tegmina olivaceous green, the nervures and inner margins of apical area black. Face moderately convex; vertex of head a little more than half as long as breadth between eyes.

Long., incl. tegm., 9 mm.

Hab. W. Africa; Cameroons, Buar.

Allied to *T. nigrinervis*, Stål, from which it is distinguished by the black face &c. The two allied species—*T. cosmopolita*, Sign., and *T. nigrinervis*, Stål, are also found in the Cameroons.

Tettigoniella latomarginata, sp. n.

Head, pronotum, and scutellum ochraceous; vertex with five black spots, three anterior and submarginal and two basal; pronotum with a transverse central basal spot, sometimes broken centrally, and a small spot near each anterior angle black; scutellum unspotted; body beneath and legs ochraceous; tegmina olivaceous green, with a broad pale ochraceous costal margin.

Long., incl. tegm., 7–8 mm.

Hab. Queensland; Upper North Pine (*Froggatt*); Tambourine Mt., Moreton Bay.

Allied to *T. albomarginata*, Sign., but with the vertex of

the head a little longer and more conically produced, markings of the pronotum different, scutellum unspotted, and the pale costal margin to the tegmina very much broader.

Tettigoniella richmondensis, sp. n.

Head, pronotum, and scutellum ochraceous ; vertex of head with a sinuated anterior marginal fascia and two large longitudinal spots at base black ; pronotum with the lateral marginal areas, and a large triangular spot at base, its apex more narrowly connected with the anterior margin, black ; scutellum with two large discal black spots extending from the anterior margin to the transverse incision ; body beneath and legs ochraceous, face with a central longitudinal black line ; tegmina dark indigo-blue, with a narrow subcostal pale ochraceous margin ; vertex of head broad, moderately anteriorly conically produced ; scutellum very strongly transversely incised near middle.

Long., incl. tegm., $8\frac{1}{2}$ mm.

Hab. New South Wales ; Richmond River.

Subfam. *JASSINÆ*.

Hecalus parvipicta, sp. n.

Head, pronotum, and scutellum ochraceous ornamented with some small black spots, of which two are on apical margin and three on basal margin of vertex, four on anterior area of pronotum—arranged longitudinally in pairs—one on each lateral margin of scutellum, and one on each side of face near eyes ; body beneath and legs ochraceous, a somewhat large spot on lateral margins of sternum, an apical spot to femora, margins of posterior tibiæ (sometimes broken into a continuous series of small spots) black ; tegmina more or less ochraceous, on disk darker by reflecting the abdomen beneath, a small black spot at apex of clavus ; vertex of head broader than long, moderately concave and upwardly directed anteriorly ; pronotum moderately convex ; face moderately longitudinally convex.

Long., incl. tegm., 9–10 mm.

Hab. Egypt ; Sobat River (*Ph. C. Zaphiro*). Abyssinia ; Kog, Gilo River (*Ph. C. Zaphiro*).

XIX.—On the Arrangement of the South American Rats allied to *Oryzomys* and *Rhipidomys*. By OLDFIELD THOMAS.

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WHEN writing some years ago* on the relation of *Oryzomys* and *Rhipidomys* to each other and the allied forms *Thomasomys* and *Æcomys*, with lists of the forms belonging to each, I indicated certain species as of doubtful position, and I have now had an opportunity to re-examine these in the light of further material.

As then explained, all these rats are divisible into two groups, those with the structure of the palate as in *Oryzomys* (*Oryzomys* and *Æcomys*) and those with it as described and figured by Bangs † in his "*Erioryzomys*" (*Rhipidomys* and *Thomasomys*). Of the first of these groups only one species, "*Hesperomys*" *rufescens*, was referred to as doubtful, and of this animal an additional example, without locality, has lately been found among some old specimens put aside as duplicates, and I have therefore been able to make a further study of it.

The second specimen, although its skull is very dilapidated, happens to show the posterior palate, and is also much younger than the type, with almost unworn teeth, so that an opinion can be formed as to its systematic position.

On studying the characters observable on the two specimens I find that the animal, while belonging to the *Oryzomys*-*Æcomys* series, certainly represents a genus distinct from any of its allies, its molar structure being indeed quite unique in the group.

It may be called:—

RHAGOMYS, gen. nov.

General facies about as in *Æcomys*. Feet modified for an arboreal life, with large plantar and digital pads. Mammæ apparently 1—2=6, as in *Rhipidomys*.

Skull broad and low, with broad, smooth, rounded brain-case; supraorbital edges square, not ridged. Zygomatic

* Ann. Mag. N. H. (7) xviii. p. 442 (1906).

† P. New Engl. Zool. Club, i. p. 96, pl. i. fig. 3 (1900).

plate little projected forward. Palatal foramina short and little open. Posterior palate of the general structure of that of *Oryzomys* and *Ecomys*, not as in *Rhipidomys* and *Thomasomys*.

Upper incisors approaching the vertical, angle with tooth-row about 80° , deep antero-posteriorly, their front surface flattened and inclined inwards, so that the resulting relations of the two teeth and the shapes of their tips are about as in the Dormice, not as in any of the genera above mentioned. Lower incisors of corresponding form, anteriorly, their roots extended backwards much beyond the normal, forming a prominent capsule outside the jaw, halfway between the coronoid and the condyle. Both the shape and implantation of the incisors therefore indicate unusual gnawing powers.

Molars showing a remarkable modification of the structure found in *Ecomys* and *Oryzomys*, for while the number and positions of the cusps are the same, the various foldings and ridges between and connecting the cusps are almost entirely obsolete. The teeth are therefore almost as in certain Phyllostomid bats, with smooth glossy surface and simple conical cusps, which are evenly spaced, slightly slanted backwards, 6, 4, and 2 in number on the three teeth. Below the teeth are similarly modified, the cusps slanting forwards.

Genotype: *Rhagomys rufescens* (*Hesperomys rufescens*, Thos.).

Without a much greater knowledge than I possess of the structural modifications of the molars of this group, and the systematic value that should be attached to their simplification in *Rhagomys*, I should not venture to express a definite opinion as to its affinities, but I should suppose it to be, on the whole, most nearly allied to *Ecomys*, with which it agrees in general facies and palatal structure, but from which, as from every other genus of the group, it may be readily distinguished by the remarkable modification of both incisors and molars above described.

Still younger specimens of *Rhagomys* will be very welcome to show what trace of the normal foldings and ridges is exhibited by the molars when absolutely unworn; but it is evident there cannot be much.

Of the second group, those with the mesopterygoid fossa continued forward between the posterior molars (*Rhipidomys*, *Thomasomys*, &c.), the doubtful species are more numerous, and I find the whole group needs revision, owing to the

diverse characters of some of the forms included in it. In this revision, by removing some of the most diverse into special genera, the groups that remain are rendered more clear-cut and definable, to the great advantage of students of the subject.

There would appear to be five genera of this group that might be recognized, as shown in the following key:—

- A. Molars of normal *Oryzomys* structure, with brachyodont crowns.
 - a. Anterior zygomatic plate not projecting forwards enough to be visible from above.
 - a². Without raised supraorbital beading continued across brain-case. M^1 of evenly oblong shape, its antero-internal tubercle not or little reduced. Mammæ 1—2=6.
 - a³. Interorbital region flat, its edges forming overhanging divergent ledges. Feet broad, with flattened pads; claws short, strongly curved, broad at base 1. *Rhipidomys*.
 - b³. Interorbital region without ledges, though in the larger species the edges may be sharpened. Feet narrow, with high pads; claws longer, less curved, narrower 2. *Thomasomys*.
 - b². With raised supraorbital beading continued across brain-case. M^1 not evenly oblong, the antero-internal cusp reduced. Mammæ 2—2=8 3. *Phanomys*.
 - b. Anterior zygomatic plate projecting forwards, visible from above. Skull with long heavy muzzle and small brain-case 4. *Delomys*.
- B. Molars of less typical *Oryzomys* structure, the crowns slightly hypsodont. Build of skull suggesting *Oxymycterus* or *Microxus* 5. *Inomys*.

The removal of the species *ferrugineus*, *dorsalis*, and *sublineatus* from *Thomasomys* simplifies the definition and reduces the range of that genus, as these three were outlying Brazilian forms with a different mammary formula, as compared with the true *Thomasomys*, which inhabits the northern part of the Andean area, with extension eastwards to British Guiana.

One Andean species also, *incanus*, shows such marked special characters that I have formed a peculiar genus for its reception.

The following are short diagnoses of the genera now recognized, with lists of the species included in them.

1. RHIPIDOMYS, Tschudi.

Form modified for arboreal life. Tail heavily pencilled. Feet broad, the pads broad and low. Claws short, strongly curved, their breadth at base equalling or exceeding their length on their concave edge. Mammæ 1—2=6.

Skull with large rounded brain-case. Interorbital region broad and flat, its edges sharpened into ledges more or less overhanging the orbits, but without any upwardly projecting beading.

Antero-internal cusp of m^1 slightly reduced, but not sufficiently so to affect the general oblong shape of the tooth.

Genotype. *R. leucodactylus*, Tschudi (*Hesperomys leucodactylus*, Tsch.).

Species and subspecies:—

bovallii, Thos.
caucensis, All.
cearanus, Thos.
cocalensis, All.
couesi, All.
elatturus, Osg.
equatoris, Thos.
fervidus, Thos.
fulviventris, Thos.
goodfellowi, Thos.
latimanus, Tomes.
lucullus, Thos.
macrurus, Gerv.
mastacalis, Lund.

microtis, Thos.
milleri, All.
mollissimus, All.
nitela, Thos.
ochrogaster, All.
pictor, Thos.
quindianus, All.
scandens, Goldm.
sclateri, Thos.
similis, All.
yuruanus, All.
venezuelæ, Thos.
venustus, Thos.

2. THOMASOMYS, Coues.

Syn. *Erioryzomys*, Bangs.

Form not specially modified. Tail well haired. Feet of normal proportions, the pads high, not broadened. Claws comparatively long and slender, not unusually curved. Mammæ 1—2=6.

Skull of medium proportions. Interorbital region narrower than in *Rhipidomys*, sometimes concave, its edges generally rounded, but sometimes, in the larger species, raised and sharpened, but never forming overhanging ledges or distinct beading.

M^1 of normal oblong shape.

Genotype. *T. cinereus*, Thos. (*Hesperomys cinereus*, Thos.).

Species and subspecies :—

altorum, All.
aureus, Tomes.
baeops, Thos.
cincereiventer, All.
daphne, Thos.
gracilis, Thos.
hylophilus, Osg.
ischyrus, Osg.
kalinowskii, Thos.
laniger, Thos.
macconnelli, de Wint.

monochromos, Bangs.
niveipes, Thos.
notatus, Thos.
paramorum, Thos.
popayanus, All.
prætor, Thos.
princeps, Thos.
pyrrhonotus, Thos.
rhoadsi, Stone.
taczanowskii, Thos.
vestitus, Thos.

3. *PHÆNOMYS*, gen. nov.

Form normal. Tail short-haired. Claws slender, not specially curved. Mammæ 2—2=8.

Skull slender, of normal proportions. Interorbital region slightly concave, its edges forming definite raised beadings, continued backwards across the parietals.

Incisors rather heavy. M^1 not so evenly oblong as in the other genera, the antero-internal cusp more definitely reduced.

Range. South-eastern Brazil (Bahia, Rio Janeiro).

Genotype and only species. *Phænomys ferrugineus*, Thos. (*Oryzomys ferrugineus*, Thos.).

4. *DELOMYS*, gen. nov.

Form normal. Tail quite short-haired, about as in *Oryzomys*. Claws normal. Mammæ 2—2=8 in two specimens of *D. dorsalis* from Rio Grande do Sul, 1—2=6 in one, believed to represent a new subspecies, from Rio Janeiro. The latter number may be an abnormality.

Skull long, with long heavy muzzle and small brain-case. Interorbital region rather broad, smooth, its edges rounded, or slightly squared, not ridged or beaded. Zygomatic plate projected forwards above far enough to be seen from above, that of all the other forms mentioned in the present paper absolutely without projection.

Molars rather narrow. M^1 evenly oblong.

Range. South-eastern Brazil, from Espiritu Santo to Rio Grande do Sul.

Genotype. *Delomys dorsalis* Hens. (*Hesperomys dorsalis*, Hens.).

Other forms :—" *Oryzomys* " *sublineatus*, Thos. and a new subspecies of *dorsalis* described below.

5. *INOMYS*, gen. nov.

External characters as in *Thomasomys*; mammæ not known.

Skull recalling in shape that of *Oxymycturus* or *Microxus*, with broad low rounded brain-case and long narrow snout. Interorbital region smoothly rounded. Incisors small and delicate.

Molars rather narrow, their crowns higher than in any other of the genera now dealt with. Their foldings, however, essentially as in *Oryzomys* and all the present group of genera, not as in *Oxymycturus*.

Range. Central Peru. (Only known from Vitoc.)

Genotype and only species. *Inomys incanus*, Thos. (*Oryzomys incanus*, Thos.).

The distinction of this genus rests mainly on the peculiar shape of the skull, which, with its broad low brain-case, long narrow snout, rounded interorbital region, and small incisors curiously recalls that of an *Oxymycturus* or *Microxus*. Its molars, however, show the typical structure of the molars of the present group, and its interparietal is of full normal size. Its removal from *Thomasomys* renders far more uniform the skull-shape of the species to be referred to that genus, as it was the one outstanding species in this respect.

The following is the description of a new subspecies of *Delomys*:—

Delomys dorsalis collinus, subsp. n.

General characters of true *dorsalis* of Rio Grande do Sul, the colour approximately the same, and the fur similarly soft and rich, and so equally differing from the harsh-furred *D. sublineatus* of Espiritu Santo. But the size, and especially the size of the teeth, averages greater, the molar tooth-row measuring 5.0 mm. in length, while in a considerable series of true *dorsalis* this measurement is only 4.5 to 4.7 mm., the teeth of *collinus* being also perceptibly broader. No doubt the two forms will be found to intergrade, but the difference is so constant locally that it should be recognized by name. In the series available the belly is rather more whitish and less buffy, and the underside of the tail is less decidedly whiter than the upper than is the case in *dorsalis*.

Mammæ in the only female 1—2=6, instead of 2—2=8

as in *D. dorsalis*, but this may possibly be an individual aberration.

Dimensions of the type, measured on a spirit-specimen :—

Head and body 130 mm. ; tail 132 ; hind foot 30 ; ear 21.

Skull, greatest length 33·8 ; condylo-incisive length 29·5 ; zygomatic breadth 16·3 ; interorbital breadth 5 ; palatilar length 13·3 ; palatal foramina 6·8 ; upper molar series 5·0.

Hab. N.E. São Paulo and neighbouring parts of Rio Janeiro. Type from Itatiaya, Rio Janeiro, 4800 ft. ; other specimens from Piquete, São Paulo, 2500 ft. (*A. Robert*), and Alto da Serra, São Paulo (*São Paulo Museum*).

Type. Adult male. B.M. No. 14.2.23.12. Collected 22 August 1913 and presented by Prof. J. P. Hill, F.R.S. Six specimens examined.

Our series of *D. dorsalis* consists of four spirit-specimens from Rio Grande do Sul, the type-locality of the species, collected by Dr. H. von Ihering, and a nice set of skins from Roça Nova, Parana, obtained by Alphonse Robert in 1903.

XX.—Two new *Rats* of the *Rattus confucianus* Group.

By OLDFIELD THOMAS.

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My attention having been drawn to some rats referred to *Rattus confucianus* from Formosa presented by Mr. Goodfellow, I have made an examination of them and find that not only do they represent a new species allied to the large Sze-chwan *R. excelsior*, but that the specimens of "*R. confucianus*" from the Imperial Tombs, E. of Peking, collected by Mr. Malcolm Anderson, also need description.

Rattus culturatus, sp. n.

Size of *R. excelsior* ; skull with supraorbital beading.

General appearance about as in *R. excelsior*, that is, very like *R. confucianus* but larger. Fur long and shaggy.

Colour varying from mouse-grey to hair-brown, more "saturate"-looking than in *R. confucianus* and *excelsior*, the latter especially being a much browner animal. Under surface as usual sharply contrasted creamy white, the white

area perhaps a little more limited in extent than usual, especially behind. Hands white. Feet greyish brown with white digits. Tail as long as in *excelsior*, well haired, blackish above for three-fourths its length, white below and for its terminal two or three inches above.

Skull decidedly larger than that of *confucianus*, about equalling that of *excelsior*, from which it differs by having well-developed supraorbital ridges, as in the first-named species. Palatal foramina long and well open.

Dimensions of the type, measured on skin :—

Head and body 186 mm. ; tail 216 ; hind foot 34.

Skull, greatest length 42 ; condylo-incisive length 37.2 ; zygomatic breadth 18.6 ; nasals 16 ; interorbital breadth 6 ; breadth of brain-case 16 ; palatilar length 18 ; palatal foramina 8.4 ; post-foraminal palate 7 ; molar series 7.2.

Hab. Mt. Arizan, Formosa. Alt. 8000 ft.

Type. Adult male. B.M. 12.11.23.21. Collected Feb. 1912 and presented by Walter Goodfellow, Esq. Seven specimens.

Whether this is a Formosan representative of *R. excelsior* of the Western Chinese Highlands or simply a larger island form of *R. confucianus* it is not easy to say, but on account of its highland habitat, and the curious relationship that Formosan animals often have to Tibetan forms, I am rather in favour of the former view. But in any case it needs a distinctive name.

Rattus confucianus chihliensis, subsp. n.

A greyish north-eastern form of *confucianus*, with comparatively short tail.

General colour of summer skins greyish-brown approximately as in the true Sze-chwan *confucianus*, not strongly buffy clay colour as in *sacer*, *canorus*, and *luticolor*, which in Shantung, Kansu, and the Ordos region make a line of pale forms separating the present darker, or at least greyer, animal from the Sze-chwan race. Under surface white, sharply defined, the white of considerable extent, with the line of demarcation high up. Hands and feet white, with slight metatarsal darkening. Tail comparatively short, 144, 146, and 158 mm. in three examples as compared with lengths of 155–180, usually about 170, mm. in the other forms ; well haired, slightly pencilled, the terminal 2–3 inches white all round.

Skull as in *R. c. sacer*, except that the palatal foramina

average decidedly shorter. In seven skulls of *sacer* the foramina are 6·7 mm. in length or more, while in three specimens of *chihliensis* they are 6·1 mm. or less. Molars smaller.

Dimensions of the type, measured in flesh :—

Head and body 135 mm. ; tail 146 ; hind foot 26·5 ; ear 22.

Skull, greatest length 38 ; condylo-incisive length 35 ; zygomatic breadth 17·3 ; nasals 13·2 ; interorbital breadth 5·4 ; breadth of brain-case 15 ; palatilar length 16 ; palatal foramina 6·1 ; upper molar series (much worn) 5·6—of a younger specimen, unworn, 5·3.

Hab. Imperial Tombs, 65 miles E. of Peking. Alt. 1000 ft.

Type. Old male: B.M. No. 8.8.7.31. Original number 1551. Collected 17 September, 1907, by M. P. Anderson. Presented by the Duke of Bedford, K.G.

Even if the greyer colour is, as it may be, largely due to the specimens being all in the spinous summer coat, this subspecies deserves recognition by its shorter tail, shorter palatine foramina and smaller teeth. It is the farthest to the north-east of the races of *R. confucianus*.

BIBLIOGRAPHICAL NOTICE.

Australasian Antarctic Expedition, 1911-14, under Sir Douglas Mawson. Scientific Reports. Series C. Zoology and Botany. Vol. IV. part 1. Mollusca. By C. HEDLEY, F.L.S. &c. Pp. 80, 9 pls.

THIS is the second part of the series published so far, the first (vol. iii. pt. 1) being on the Fishes by E. R. Waite ; and both do great credit to their begetters, being both well done and well got up.

Mr. Hedley describes some 125 species of Mollusca, obtained from the twelve dredging-stations on Adelie Land and from Macquarie Island, including 41 new species and 2 new genera. All these new forms are most excellently illustrated, though one could wish that the degree of magnification or reduction had been indicated on the plates, or at least given in their explanations. No general deductions are given, all such, we believe, being reserved for special treatment when all the branches of zoology have been dealt with. Mr. Hedley, however, does point out that "about a third of the Mollusca reported from Macquarie Island extend to Kerguelen, and some range round the pole to the Falkland Islands and New Georgia," whilst he considers that probably some of the forms here described as new will be eventually traced to other subantarctic lands.

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THE ANNALS
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[EIGHTH SERIES.]

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XXI.—*Descriptions of New Pyralidæ of the Subfamilies*
Hydrocampinæ, Scopariinæ, &c. By Sir GEORGE F.
HAMPSON, Bart., F.Z.S., &c.

[Continued from vol. xix. p. 473.]

(27 a) *Aulacodes mesoscialis*, sp. n.

Head and front part of thorax white with some dark red-brown on shoulders and tegulæ, the hinder part of thorax yellow; abdomen white at base, then yellow; antennæ yellow; palpi yellow, white at base; pectus, legs, and ventral surface of abdomen white, the legs tinged with yellow, the fore femora above and tibiæ at extremities dark brown. Fore wing golden yellow; a white patch in end of cell; a red-brown fascia on costal area to beyond middle, where it is conjoined to a deeper red-brown patch beyond the cell confluent with a red-brown fascia on medial area extending from the cell to above the inner margin, which is white below it; a triangular silvery-white postmedial patch beyond the red-brown area from below costa to vein 4; an obliquely curved silvery white subterminal band from costa to vein 1, defined on inner side by a rather diffused red-brown line and on outer by a fine black line; a terminal series of black points; cilia white tinged with red-brown. Hind wing white, the inner area and terminal area broadly golden yellow, the white area defined by an oblique black postmedial line between vein 4 and the submedian fold; an oblique silvery white line from costa before apex to termen at discal fold; minute ocellate white spots defined by black and with black points on their outer edges before termen above and below vein 4, then a small

black spot on termen below vein 3 and striga below vein 2, each with a small black subterminal mark before them; cilia white tinged with red-brown and with a brown line near base beyond the spots.

Hab. DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♂, 1 ♀ type.
Exp., ♂ 20, ♀ 22 mm.

(27 b) *Aulacodes hemithermalis*, sp. n.

♂. Head and thorax golden yellow, the base of tegulae, shoulders, tips of patagia, and metathorax red-brown; abdomen golden yellow with some white at base, the anal tuft brown; palpi white with red-brown band near extremity of 2nd joint; pectus and ventral surface of abdomen white; legs yellow, the fore femora above and tibiae on inner side and at extremity dark brown, the tuft of hair in fold of mid tibiae brown. Fore wing with the costal area and cell to beyond its extremity deep red-brown, the inner area obliquely deep red-brown to origin of vein 2 with the inner margin below it except towards base white; some yellow in base of cell and the fold in end of cell white; the rest of wing orange-yellow; a wedge-shaped silvery white postmedial patch from below costa to vein 4 beyond the brown area, defined on outer side by a brown line; an obliquely curved silvery white subterminal band from below costa to above vein 1, defined on inner side by a rather diffused brown line and on outer by a fine black line; a terminal series of black points; cilia silvery white tinged with red-brown. Hind wing silvery white, the inner and terminal areas broadly golden yellow; some red-brown at base; an oblique sinuous black postmedial line from vein 6 to submedian fold defining the white area; an obliquely curved silvery white line from costa before apex to termen at discal fold; minute ocellate white spots defined by black and with black points on their outer edges before termen above and below vein 4, then minute black spots on termen with minute white lunules defined by black before them above and below vein 2, the termen between them orange-red and with a black point above vein 5; cilia silvery white tinged with red-brown at apex and with a brown line at base beyond the spots.

♀. Fore wing with oblique white bar across end of cell.

Hab. DUTCH N. GUINEA, Wataikwa R. (*Wollaston*), 1 ♂, 2 ♀ type, Snow Mts., Setekwa R. (*Meek*), 3 ♀. *Exp.* 20–24 mm.

(27 d) *Aulacodes chrysoxantha*, sp. n.

♀. Head, thorax, and abdomen golden yellow, the dorsum of thorax tinged with red-brown; antennae ringed with red-brown towards base; lower part of frons and palpi red-brown, the latter white towards base; pectus and ventral surface of abdomen white; legs yellow, the fore femora above and tibiae at extremities dark brown, the tarsi white ringed with red-brown. Fore wing golden

yellow; the costal area red-brown to well beyond the cell, where it expands into a triangular patch extending to vein 2, the red-brown on basal area extending to just below the cell; some red-brown at middle of inner margin; a wedge-shaped silvery white postmedial patch from below costa to vein 3 beyond the red-brown area; a narrow obliquely curved silvery white subterminal band from costa to vein 1, defined on outer side by a fine black line; a terminal series of black points; cilia silvery white tinged with red-brown and with a brown line near base. Hind wing with the base, inner area, and the terminal area broadly golden yellow, the rest of wing white extending on costa from near base to near apex and narrowing to vein 1; a minute brown spot in the cell near base and a brown striga defining the yellow area in and just below the cell; an oblique sinuous black postmedial line between discal and submedian folds defining the white area; a small metallic silver subapical spot defined on outer side by blackish; a small metallic silver ocellate spot defined by black and with black point on its outer edge below vein 5 before termen, then black points on termen below veins 4 and 3 and a striga below vein 2 with minute black lunules before them; cilia silvery white, tinged with red-brown at apex and with brown line at base towards apex and beyond the spots.

Hab. DUTCH N. GUINEA, Mimika R. (*Wollaston*), 3 ♀, Snow Mts., Setekwa R. (*Meek*), 1 ♀. *Exp.* 18–22 mm.

(27 h) *Aulacodes metazonalis*, sp. n.

♀. Head and thorax white, the tegulæ at middle and sides, the patagia at tips, and the metathorax yellow; abdomen white with dorsal yellow fascia, the anal tuft yellow; antennæ yellow; palpi rufous, white at base and in front, the 3rd joint white at base and tips; pectus, legs, and ventral surface of abdomen white, the legs tinged with yellow, the fore femora above and tibiae on inner side red-brown, the tarsi ringed with red-brown. Fore wing rufous to submedian fold and to the subterminal band and on basal part of inner area, the rest of inner area and the terminal area golden yellow; a silvery white fascia below the cell and basal half of vein 2; a triangular silvery white postmedial patch from below costa to vein 4, the costa above it yellow; an obliquely curved silvery white subterminal band from costa to above vein 1, where it ends in a point, defined on outer side by black points; a terminal series of black points and striga at submedian interspace; cilia silvery white, tinged with rufous except at base. Hind wing silvery white, extending on costa to near apex, the terminal half golden yellow extending on inner area to near base; a red-brown subbasal spot in the cell; an oblique dark brown postmedial line from below costa to submedian fold, defining the white area; a silvery white subterminal band between discal and submedian folds, defined on inner edge by fuscous and on outer by a black line; minute silvery white ocellate spots defined by black and with black points on their outer edges before termen above and below vein 4, a

black point on termen below vein 3, then a fine line to submedian fold; cilia white tinged with rufous and with red-brown line near base between discal and submedian folds.

Hab. BISMARCK ARCH., Rook I. (*Meek*), 3 ♀ type. *Exp.* 24 mm.

(27 i) *Aulacodes aurantipennis*, sp. n.

♂. Head, thorax, and abdomen bright orange; palpi rufous towards tips; pectus, legs, and ventral surface of abdomen white tinged with yellow, the fore femora above and tibiae on inner side suffused with brown. Fore wing bright orange, the costa suffused with rufous to beyond the cell, where it expands into an oblique wedge-shaped rufous patch to vein 3; some rufous on middle of inner margin; the fold in end of cell whitish; a triangular silvery whitish postmedial patch from below costa to vein 3 beyond the rufous patch, defined on outer side by brown; an obliquely curved silvery white subterminal band from costa to above vein 1, defined on inner side by brownish and on outer by a fine blackish line; a terminal series of black points and striga at submedian interspace; cilia silvery white with a brown line near base. Hind wing bright orange; a whitish patch suffused with red-brown in, below, and beyond end of cell, defined on outer side by an oblique sinuous red-brown line; an oblique silvery white subapical bar tinged with red-brown; minute silvery white ocellate spots defined by black and with black points on their outer edges before termen above and below vein 4, and black points on termen above and below vein 2, with black striae before them; cilia silvery white, red-brown at base towards apex and dark brown beyond the spots.

Hab. DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♂ type. *Exp.* 22 mm.

(27 j) *Aulacodes argenteopicta*, sp. n.

Head, thorax, and abdomen bright orange; palpi with brown rings on 2nd and 3rd joints; fore femora above and tibiae on inner side dark brown, the tarsi ringed with brown. Fore wing bright orange; a brown streak below base of costa; an oblique black streak above middle of inner margin; the fold in end of cell whitish; an incurved black line beyond the cell between veins 7 and 4 defining the inner side of an oblique triangular pale orange patch; a narrow obliquely curved metallic silver subterminal band from below costa to above vein 1 where it is bent inwards, defined on outer side by a fine black line; a terminal series of black points and striga at submedian interspace; cilia silvery white tinged with brown. Hind wing bright orange; an oblique sinuous black postmedial line between the discal and submedian folds; an obliquely curved metallic silver subapical bar defined on outer side by a blackish line; minute metallic silver ocellate spots defined by black and with black points on their outer edges before termen above and below vein 4, a minute black spot on termen below vein 3 and bar

below vein 2, and a minute black point on termen above vein 5; cilia metallic silver.

Hab. DUTCH N. GUINEA, Mimika R. (*Wollaston*), 2 ♂, Snow Mts., Up. Setekwa R. (*Meek*), 1 ♂, 3 ♀ type. *Exp.* 20-24 mm.

(28 a) *Aulacodes mediofascialis*, sp. n.

♀. Head whitish; thorax whitish tinged with yellow in front, red-brown behind; abdomen white, suffused with yellow except towards base, the anal tuft rufous at extremity; antennæ yellow; palpi red-brown ringed with white; pectus, legs, and ventral surface of abdomen white, the legs tinged with yellow, the fore femora above and tibiæ on inner side red-brown, the tarsi ringed with brown. Fore wing with the costal area yellow irrorated with red-brown; a broad red-brown fascia from base of inner margin through the end of cell to the subterminal band, before which it expands to just below costa and to vein 2, its lower edge oblique and sinuous to origin of vein 2, then downcurved, the area below it silvery white; a conical silvery white postmedial patch between veins 7 and 4; a narrow oblique silvery white subterminal band from below costa to submedian fold, defined on outer side by minute black lunules; the terminal area yellow, bent inwards on inner margin to near middle; a terminal series of black points; cilia silvery white. Hind wing silvery white, the terminal area broadly and inner area to near base yellow, the base red-brown; an oblique sinuous dark brown postmedial line between discal and submedian folds defining the white area; an oblique wedge-shaped silvery white mark from costa before apex, defined by fine black lines; minute ocellate silvery-white spots defined by black and with their outer edges produced to black points before termen above and below vein 4, a black point on termen below vein 3, and striga below vein 2, with minute black bars well before them, some orange on termen between the ocellate spots; cilia silvery white, brown at base towards apex and beyond the spots.

Hab. DUTCH N. GUINEA, Mimika R. (*Wollaston*), 2 ♀, Wataikwa R. (*Wollaston*), 3 ♀ type, Snow Mts., Up. Setekwa R. (*Meek*), 3 ♀. *Exp.* 18-22 mm.

(30 e) *Aulacodes thermichrysis*, sp. n.

♂. Head, thorax, and abdomen golden yellow tinged with rufous; antennæ white tinged with rufous; palpi with the base white, defined above by an oblique deep rufous line; pectus, legs, and ventral surface of abdomen white, the legs tinged with yellow, the fore tibiæ black-brown at extremities. Fore wing grey-white tinged with brown, the costal area rufous to end of cell; a curved yellowish rufous fascia from inner margin before middle to tornus, leaving some grey on inner margin beyond middle; a triangular deep rufous postmedial patch from below costa to vein 4, its lower extremity connected by an oblique yellowish rufous bar with the

curved yellowish subterminal band tinged with and defined by rufous from costa to vein 2, with a silvery grey band beyond it before the golden yellow terminal band defined on inner side by a black line from costa to vein 1; a terminal series of black points; cilia silvery white tinged with brown. Hind wing with the basal area grey-white tinged with brown, extending on costa to well beyond middle and on inner area to tornus, its outer edge defined by an oblique sinuous dark brown postmedial line between discal and submedian folds; the postmedial area golden yellow from below costa to above inner margin, its outer edge produced to termen at discal fold; the apical area and a subterminal band from vein 5 to inner margin grey-white tinged with brown; a terminal golden yellow band between discal and submedian folds with a series of minute ocellate silvery white spots defined by black and with black points on their outer edges before termen, paired below veins 5, 4, 3, and single below vein 2; cilia silvery white tinged with brown and with brown line near base.

Hab. BISMARCK ARCH., Rook I. (*Meek*), 4 ♂ type. *Exp.* 28 mm.

(30g) *Aulacodes coniferalis*, sp. n.

Head, thorax, and abdomen white, the last suffused with brownish ochreous towards extremity; palpi with brown band near extremity of 2nd joint; legs tinged with yellow, the fore femora above and tibiae on inner side and at extremities dark brown, the tarsi ringed with brown. Fore wing silvery white; the costal area cupreous rufous to beyond the cell, where it expands into a triangular reddish yellow patch before a conical silvery white postmedial patch from below costa to vein 4, defined by black except above; the terminal area broadly golden yellow, emitting a fascia below the cell to middle with an oblique black mark before its lower extremity above inner margin; a narrow oblique metallic silver subterminal band from below costa to above inner margin, where it is slightly angled inwards, defined on outer side by a slight blackish line; a terminal series of black points; cilia silvery white tinged with rufous. Hind wing silvery white, the terminal area broadly pale yellow except towards tornus, defined on inner side by an oblique black postmedial line from vein 5 to submedian fold; an oblique silvery white line from costa before apex to termen at discal fold; minute ocellate silvery spots defined by black and with black points on their outer edges before termen above and below vein 4, a black point on termen below vein 3 with a striga before it and a striga on termen below vein 2, some orange on termen between the spots; cilia silvery white, tinged with rufous towards apex and with brown line at base beyond the spots.

Hab. DUTCH N. GUINEA, Snow Mts., Up. Setekwa R. (*Meek*), 1 ♂, 1 ♀ type. *Exp.* 16 mm.

(30 h) *Aulacodes flavifascialis*, sp. n.

♀. Head, thorax, and abdomen white; antennæ with dark rings at middle; palpi yellow, the 3rd joint white; fore tibiæ yellow with a brown band at extremities, the tarsi ringed with brown. Fore wing silvery white; the costal area tinged with red-brown to end of cell; a yellow fascia above inner margin from near base to the subterminal band; an oblique dark brown bar beyond the cell from below costa to vein 4 with some reddish brown before it beyond the cell; an oblique golden yellow band from costa to vein 2 before the silvery white subterminal band; a yellow terminal band defined on inner side by a black line; a terminal series of black points; cilia silvery white tinged with red-brown at tips. Hind wing silvery white, the terminal area broadly pale yellow; an oblique black postmedial line between discal and submedian folds defining the white area; an oblique silvery white line from costa before apex to termen at discal fold; small ocellate silvery white spots defined by black and with minute black spots on their outer edges before termen above and below vein 4, a minute black spot on termen below vein 3 and striga below vein 2, each with a black striga before it, some orange on termen between the spots; cilia silvery white with a brown line near base beyond the spots.

Hab. DUTCH N. GUINEA, Mimika R. (*Wollaston*), 15 ♀ type. *Exp.* 18–20 mm.

(30 j) *Aulacodes argentimaculalis*, sp. n.

♂. Head, thorax, and abdomen silvery white, the shoulders cupreous rufous, the tips of patagia and metathorax golden, the abdomen with golden bands except at base; antennæ golden yellow; palpi rufous, white in front towards base; pectus, legs, and ventral surface of abdomen silvery white, the fore coxæ yellow in front, the femora above and tibiæ on inner side, the tibiæ on outer side, and tarsi yellow, the latter brown at extremities, the mid tibiæ yellow, brown at base. Fore wing cupreous rufous; an orange fascia below costa; a silvery white patch on inner basal area with oblique outer edge, a quadrate medial patch with elongate spot above it in end of cell; a rounded postmedial patch from below costa to vein 4, defined by brown except above and with its upper extremity somewhat produced; a curved subterminal band from below costa to inner margin, expanding on inner side between veins 7 and 4 and in submedian interspace into a rather wedge-shaped patch; a golden yellow terminal band defined on inner side by a fine black line; a terminal series of black points; cilia silvery white tinged with rufous. Hind wing silvery white; a reddish-brown antemedial line from cell to vein 1 with some yellow before it above vein 1; a reddish brown postmedial line from vein 6 to submedian fold with the area beyond it golden yellow; some golden yellow at apex and on termen below vein 1; three small

rather elongate silvery white spots defined by black before termen between veins 5 and 2, with eight black points beyond them on termen; cilia silvery white with a brown line at base, at apex, and beyond the spots.

♀. Fore wing yellower and less tinged with rufous.

Hab. BR. N. GUINEA, Mambare, R. Biagi (*Meek*), 3 ♂, 1 ♀ type. *Exp.*, ♂ 22, ♀ 24 mm.

(31 d) *Aulacodes longiplagialis*, sp. n.

♀. Head, thorax, and abdomen silvery white, the shoulders red-brown, the patagia tinged with yellow at tips, the metathorax with red-brown, the anal segment of abdomen yellow; antennæ tinged with rufous; palpi rufous; pectus, legs, and ventral surface of abdomen white, the legs tinged with rufous, the fore coxæ yellow in front. Fore wing silvery white; the costal area red-brown to well beyond the cell, expanding into an oblique triangular patch to lower angle of cell; the terminal area broadly bright yellow, joined below the angle of cell by a curved yellow fascia from inner margin before middle, the yellow terminal area defined on inner side by a slight obliquely curved red-brown line from costa to the fascia at lower angle of cell; a narrow curved metallic silvery subterminal band from below costa to above vein 1 where it is slightly angled inwards, defined at sides by slight black lines; a terminal series of black points; cilia silvery white, tinged with rufous towards apex. Hind wing silvery white, the terminal area broadly pale yellow, defined on inner side by an oblique black postmedial line from vein 5 to submedian fold; a curved silvery white line from costa before apex to termen at discal fold defined at sides by some brown scales; small ocellate silver spots defined by red-brown and black and with minute black spots on their outer edges before termen above and below vein 4, and minute black spots on termen above and below vein 2 with small silvery lunules defined by red-brown before them and a black point on termen above the spots, the termen between the spots orange; cilia silvery white, tinged with rufous towards apex and with brown line at base beyond the spots.

Hab. DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♀ type. *Exp.* 22 mm.

(32 a) *Aulacodes obliquivitta*, sp. n.

♀. Head, thorax, and abdomen white; antennæ tinged with rufous; palpi rufous; fore legs tinged with rufous and with brown band at extremity of tibiae. Fore wing silvery white; the costa cupreous rufous to near apex, expanding into a small patch at end of cell; an oblique cupreous red-brown antemedial bar from submedian fold to inner margin; the terminal area broadly pale yellow, emitting a wedge-shaped fascia to lower angle of cell, the inner edge of the yellow area defined by a fine red-brown line from costa to lower angle of cell; a narrow metallic silver subterminal

band from below costa to above vein 1 where it is slightly angled inwards, defined at sides by red-brown lines; a terminal series of black points; cilia silvery white, tinged with rufous towards apex. Hind wing silvery white, the terminal area broadly pale yellow, defined on inner side by an oblique black postmedial line from vein 5 to submedian fold; a curved silvery white line from costa before apex to termen at discal fold, defined on outer side by some red-brown scales; small ocellate silvery spots defined by blackish and with black points on their outer edges before termen above and below vein 4 and black points on termen above and below vein 2 with small silvery lunules defined on outer side by black before them, the termen between the spots orange, a black point on termen above the spots; cilia silvery white, tinged with rufous at apex and with brown line at base towards apex and beyond the spots.

Hab. DUTCH N. GUINEA, Wataikwa R. (*Hollaston*), 1 ♀ type. *Exp.* 18 mm.

(8c) *Parthenodes melanicalis*, sp. n.

♀. Head, thorax, and abdomen black-brown with a cupreous gloss, the shoulders and patagia with white bars, the abdomen with white segmental lines; antennæ with some white on basal joint; frons with white lines at sides; palpi white towards base, at extremity of 2nd joint, and on the 3rd joint below; pectus and legs white suffused with brown. Fore wing black-brown with a cupreous gloss; oblique antemedial and medial white lines; an oblique wedge-shaped postmedial patch from costa to vein 3 defined by white lines; a narrow white subterminal band from below costa to vein 2, its inner edge slightly incurved at middle, a small wedge-shaped white spot below it below vein 2; a white terminal line. Hind wing black-brown with a cupreous gloss; some white at base; a curved white subbasal line from cell to inner margin; a slightly sinuous white medial line; postmedial line white, excurved below costa and above inner margin and incurved at vein 2, defined on each side by darker brown; a whitish subterminal line defined on each side by darker brown, incurved at submedian fold, then bent outwards to join the whitish terminal line; cilia whitish at tips.

Hab. COLOMBIA, Choko Prov., Condoto (*Spurrell*), 1 ♀ type. *Exp.* 14 mm.

(8f) *Parthenodes mesoleucalis*, sp. n.

♀. Head, thorax, and abdomen whitish suffused with dark brown, the last with blackish segmental lines; antennæ dark brown; frons white at sides; pectus, legs, and ventral surface of abdomen white suffused with cupreous brown. Fore wing ochreous suffused with black-brown; an oblique white antecostal bar on inner area; a curved white medial line from subcostal nervure to vein 1, followed by a white band from costa to vein 1, then a white line excurved below vein 2; an oblique conical postmedial patch

from costa to vein 3, defined by white lines and with white patch in it at costa; a subterminal white band defined by black from below costa to vein 4, its inner edge incurved, then triangular white marks below veins 4, 3, 2, the last larger; a terminal ochreous band; cilia dark brown, whitish at tips. Hind wing ochreous suffused with black-brown; the base white; an oblique white antemedial line, followed by a white medial band, its outer edge excurved beyond lower angle of cell, then a white postmedial line excurved beyond the cell; a subterminal white band from below costa to vein 4 defined by black-brown, its inner edge incurved, then white spots below veins 4 and 3 and a band in submedian interspace; an ochreous terminal band; cilia black-brown at base, whitish at tips.

Hab. PERU, San Domingo (*Ockenden*), 1 ♀ type. *Exp.* 20 mm.

(8g) *Parthenodes parallelalis*, sp. n.

♀. Head and thorax rufous; abdomen ochreous whitish suffused with rufous; fore tibiae and tarsi with some darker brown; pectus, hind legs, and ventral surface of abdomen ochreous whitish tinged with rufous. Fore wing rufous; a very oblique dark brown antemedial line from costa to vein 1; a short dark streak in middle of cell and oblique dark discoidal bar; postmedial line dark brown, strongly dentate, acutely angled inwards below costa and vein 3, and ending at the antemedial line on vein 1; a dark streak on terminal part of inner margin and a dark terminal line. Hind wing ochreous white tinged with rufous; a dark discoidal point and terminal rather punctiform line.

Hab. PERU, Chanchamayo, 1 ♀ type. *Exp.* 26 mm.

(8j) *Parthenodes rufalis*, sp. n.

♀. Head and thorax white mixed with fulvous brown; (abdomen wanting); antennae white ringed with black; palpi with some black; pectus and legs white, the fore femora and tibiae fuscous above, the tarsi ringed with black, the hind tibiae tinged with cupreous brown towards extremity. Fore wing fulvous brown mixed with some white and slightly irrorated with dark brown; a faint rufous antemedial line, angled outwards below costa, then oblique; medial line red-brown defined on inner side by white, oblique to discal fold, angled outwards at submedian fold, then oblique, a rather triangular white patch beyond it from costa to lower angle of cell, diffused outwardly; postmedial line indistinct, brown slightly defined on outer side by white, angled outwards below costa, then rather inwardly oblique, a black streak beyond it on vein 7 to the subterminal line, which is white, excurved below costa, then erect; cilia white tinged with fulvous brown at base and with black line near base, the tips chequered with black at veins 7, 6 and at middle. Hind wing white with a wedge-shaped

patch of fulvous brown suffusion from median nervure before middle to termen between discal and submedian folds; a diffused brownish antemedial spot above inner margin; a blackish bar beyond lower angle of cell and bar at tornus; postmedial line brown, obsolete on costal area, excurved below discal and submedian folds; cilia white tinged with brown, a black line near base, less distinct below submedian fold, and some dark brown at tips at vein 6 and middle.

Hab. COLOMBIA, Sierra del Libane (*H. H. Smith*), 1 ♀ type. *Exp.* 18 mm.

(18 b) *Parthenodes albiceps*, sp. n.

♀. Head white; thorax and abdomen whitish mixed with red-brown; antennæ reddish brown; sides of frons and palpi red-brown, the palpi white at base, the maxillary palpi white at tips; pectus, legs, and ventral surface of abdomen white suffused with red-brown. Fore wing white thickly irrorated with red-brown especially on terminal half; antemedial line red-brown, oblique to just below the cell, then inwardly oblique; a short white fascia on costa before the postmedial line which is dark red-brown, excurved between veins 7 and 4, then very oblique; cilia dark brown with a fine white line at base and white tips. Hind wing white irrorated with red-brown except in the cell and on costal area, the terminal area more suffused with red-brown; a curved brown postmedial line, incurved at submedian fold; a fine deep rufous terminal line; cilia dark brown with a fine white line at base and white tips.

Hab. TRANSVAAL, Lemana (*Janse*), 1 ♀ type. *Exp.* 16 mm.

(4) *Perisyntrocha flavalis*, sp. n.

Head and thorax fulvous yellow; abdomen whitish suffused with fulvous yellow. Fore wing yellow, the costal area tinged with fulvous; antemedial line red-brown, oblique to median nervure, then erect; an oblique black-brown discoidal bar; postmedial line red-brown, incurved; a terminal series of black-brown striæ; cilia yellow at base, then pale glossy grey-brown. Hind wing yellow; an oblique black-brown discoidal bar; postmedial line rather diffused, brown, arising below costa, slightly excurved at vein 3, and ending on termen at submedian fold; a terminal series of black-brown striæ from apex to submedian fold; cilia white, the bases yellow, followed by a brown line to submedian fold.

Hab. CAMEROONS, Ja R., Bitje (*Bates*), 1 ♂, 1 ♀ type. *Exp.* 22 mm

(2 b) *Dracænura metaleuca*, sp. n.

♂. Head, tegulæ at middle, and thorax pale red-brown, the shoulders dark brown, the metathorax yellowish white; abdomen yellowish white, tinged with rufous towards extremity; antennæ white ringed with brown; frons and palpi deep chocolate-brown, the latter white in front

obliquely from base to near extremity of 2nd joint; pectus, legs, and ventral surface of abdomen white, the fore legs cupreous brown in front. Fore wing dark glossy brown, the inner margin white to beyond middle; a curved dark antemedial line; a small black-brown spot in middle of cell and discoidal bar; postmedial line dark brown, excurved below costa, then oblique; cilia with a fine pale line at base and white tips. Hind wing creamy white with a terminal brown band; cilia black-brown with white tips.

Hab. BR. N. GUINEA, Mt. Kebea (*Pratt*), 1 ♂ type. *Exp.* 30 mm.

(21 a) *Bradina xanthalis*, sp. n.

♂. Head and thorax whitish suffused with red-brown; abdomen white, dorsally dark brown except at base; antennæ whitish slightly ringed with brown; frons dark red-brown; palpi black-brown, obliquely white at base; pectus, legs, and ventral surface of abdomen white, the fore tibiae at extremities and mid tibiae at base brown. Fore wing pale yellow with a broad dark red-brown costal fascia; a brown discoidal striga. Hind wing white, tinged with yellow towards termen.

♀. Fore wing with the costal fascia narrower, expanding into a patch at apex, the termen tinged with brown except towards tornus; hind wing with the cilia brown at apex.

Hab. LOUISIADÉ Is., St. Aignan I. (*Meek*), 1 ♂ type; ADMIRALTY Is. (*Meek*), 1 ♀. *Exp.* 22 mm.

(25 a) *Bradina albigenitalis*, sp. n.

♂. Head and thorax glossy dark brown tinged with grey; abdomen grey-brown ringed with white, the extremity and anal tuft dark brown, the genital tufts pure white; antennæ grey-brown ringed with black; palpi white at base; pectus, legs, and ventral surface of abdomen white, the fore tibiae brown at extremities. Fore wing dark grey-brown with a purple gloss; antemedial line black-brown glossed with blue, oblique; a black-brown spot in middle of cell and elliptical discoidal spot glossed with blue; postmedial line black-brown glossed with blue, expanding into a small spot at costa, with some whitish before and beyond it, excurved to vein 2 and at vein 1; cilia black-brown at base, grey-brown at tips. Hind wing dark grey-brown with a cupreous gloss; an indistinct curved postmedial line; cilia black-brown with the tips white.

Hab. SOLOMON Is., Bougainville I. (*Meek*), 2 ♂ type. *Exp.* 32 mm.

(2 a) *Cælorhyncidia flammealis*, sp. n.

♂. Head and thorax purplish pink mixed with some whitish; abdomen whitish suffused with rufous and with dorsal dark brown stripe; antennæ red-brown ringed with dark brown; palpi purplish

pink, white at base; pectus, legs, and ventral surface of abdomen white, the fore legs and mid tibiæ above suffused with rufous. Fore wing purplish pink; an oblique sinuous yellow antemedial line; a yellow fascia on medial part of costa conjoined to a small triangular yellowish-white patch in end of cell with the small deeper pink discoidal lunule on its outer edge; postmedial line yellow, dilated at costa, excurved to vein 3 near termen, then bent inwards and obliquely excurved from vein 2 to inner margin; cilia white with some brownish yellow at base. Hind wing purplish pink, the costal area white to the subterminal line, which is yellow, curved, from the costal area to termen at submedian fold; cilia white, yellow at base to vein 2.

Hab. ECUADOR, R. Pastaza, Alpayacu (*Palmer*), 1 ♂ type. *Exp.* 30 mm.

(6) *Cœlorhyncidia cuprescens*, sp. n.

♂. Head and thorax dark red-brown with a cupreous gloss; abdomen paler red-brown glossed with grey; palpi with the 2nd joint whitish in front and at extremity; pectus, legs, and ventral surface of abdomen whitish suffused with red-brown. Fore wing dark red-brown with a cupreous gloss; a faint diffused obliquely curved dark line from costa beyond middle to middle of inner margin; the costa greyish towards apex. Hind wing reddish brown glossed with grey.

Hab. DUTCH N. GUINEA, Snow Mts., Oetakwa R. (*Meek*), 1 ♂ type. *Exp.* 30 mm.

(1a) *Diathrausta griseifusa*, sp. n.

♂. Head and thorax red-brown tinged with grey; abdomen pale red-brown tinged with grey and with slight whitish segmental lines; antennæ ringed with whitish; palpi dark grey-brown; pectus, legs, and ventral surface of abdomen pale red-brown tinged with grey. Fore wing red-brown suffused with grey-white, the terminal area whiter except towards costa; an oblique sinuous brown antemedial line; postmedial line brown with an ochreous-white triangular mark on its inner side at costa, rather inwardly oblique and sinuous, a red-brown shade on its outer side from costa to vein 2 and a whitish point at costa; a terminal series of dark bars; cilia white with a dark line near base interrupted at vein 2, the tips brown at apex and middle. Hind wing whitish tinged with brown; a slight dark terminal line; cilia with a white line at base followed by a dark line.

Hab. BRAZIL, Sta. Catherina (*Michaelis*), 2 ♂ type. *Exp.* 14 mm.

(4a) *Diathrausta leucographa*, sp. n.

♀. Head and thorax dark reddish brown mixed with some white; abdomen dark red-brown with white segmental lines; antennæ

ringed with white; frons with white lines at sides; palpi white in front to extremity of 2nd joint; pectus, legs, and ventral surface of abdomen white suffused with red-brown. Fore wing dark reddish brown with a cupreous gloss; a rather maculate white antemedial line from subcostal nervure to inner margin; a quadrate white patch in the cell towards its extremity conjoined to a spot below the cell; postmedial line white, dilated at costa, slightly excurved below costa and with minute white spots before it above and below vein 7, then slightly sinuous to vein 3 where it is interrupted and retracted to the lower extremity of the patch in the cell, then sinuous to inner margin; a minute white spot just below costa before apex and terminal spots above and below veins 6 and 2; cilia with white patches above and below middle. Hind wing dark brown with a cupreous gloss; the costal area white to beyond middle; a whitish bar at middle of cell; a white postmedial band from the costal area to vein 2 with a curved whitish line from it to inner margin, an incurved white line just beyond it from below costa to vein 2; cilia white with a dark line near base, the tips brown at vein 3 and towards tornus.

Hab. D'ENTRECASTEAUX Is., Goodenough I. (*Meek*), 1 ♀ type. *Exp.* 16 mm.

(4e) *Diathrausta fulviceps*, sp. n.

Head and tegulae except at sides fulvous yellow, the rest of thorax and abdomen glossy dark brown, the latter with the four basal segments dorsally fulvous; frons dark brown at sides; palpi dark brown, fulvous yellow in front to extremity of 2nd joint; pectus and legs whitish suffused with brown, the fore femora and tibiae dark brown in front. Fore wing dark brown with a leaden-grey gloss; an indistinct curved dark antemedial line; postmedial line blackish with a yellowish-white spot on its inner side at costa, oblique to vein 4, excurved to vein 2, then incurved; cilia dark brown at base, the tips silvery white tinged with brown towards tornus. Hind wing dark brown with a leaden grey gloss; an indistinct dark postmedial line, excurved to vein 2, then incurved; cilia dark brown at base, the tips silvery white tinged with brown towards tornus.

Hab. BR. C. AFRICA, Mt. Mlanje (*Neave*), 6 ♂ type, Luchunya R. (*Neave*), 1 ♂, 5 ♀. *Exp.* 14-18 mm.

(3) *Deuterophysa grisealis*, sp. n.

♂. Head, thorax, and abdomen white mixed with pale grey-brown, the anal tuft white; antennae white ringed with brown; palpi, pectus, legs, and ventral surface of abdomen white tinged with reddish brown. Fore wing grey-white tinged and irrorated with reddish brown; a brown antemedial line, oblique to below the cell and angled inwards at vein 1; a brown discoidal bar; postmedial line brown with a white spot on its inner side at costa, incurved below vein 3; cilia with a fine ochreous line at base followed

by a blackish line, the tips pure white. Hind wing grey-white tinged and irrorated with reddish brown, the costa white to beyond middle; slight brown bars before and beyond the discocellulars; postmedial line indistinct, brown, bent inwards at vein 2; cilia with a fine ochreous line at base followed by a black line, the tips pure white.

Hab. BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♂ type. *Exp.* 10 mm.

(4) *Deuterophysa furvitermen*, sp. n.

Head, thorax, and abdomen white mixed with red-brown, the anal tuft white; antennæ white ringed with brown; sides of frons and palpi grey-brown, the latter white at base and tips; pectus legs, and ventral surface of abdomen white tinged with red-brown. Fore wing grey-white tinged and thickly irrorated with red-brown; antemedial line red-brown, black at costa, curved; the medial area with the costa pale yellow; postmedial line red-brown, black at costa, curved; the termen fiery rufous; cilia white with a black line at middle. Hind wing grey-white tinged and thickly irrorated with red-brown; a brown discoidal bar; postmedial line red-brown, arising below the costa, bent inwards and almost obsolete at vein 2; the termen fiery rufous; cilia white with a blackish line at middle.

Hab. BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♂, 2 ♀ type. *Exp.*, ♂ 16, ♀ 18 mm.

Genus MICROPHYSETICA, nov.

Type, *M. peperita*.

Proboscis fully developed; palpi porrect, about twice the length of head and fringed with hair above and below; maxillary palpi triangularly dilated with hair; frons with small pointed conical prominence; antennæ of male laminate and annulated, ciliated. Fore wing with the apex somewhat produced; veins 3, 4 from angle of cell; 5 from just above angle; 6 from below upper angle; 7 from angle; 8, 9, 10 stalked; 11 from cell; a costal fold on underside to beyond middle. Hind wing with vein 3 from just before angle of cell; 4, 5 from angle; 6, 7 from upper angle; 7 anastomosing with 8.

Microphysetica peperita, sp. n.

♂. Head, thorax, and abdomen red-brown mixed with blackish and some whitish, the abdomen blackish towards extremity; antennæ whitish ringed with black; palpi brown, whitish in front to extremity of 2nd joint; pectus, legs, and ventral surface of abdomen towards base whitish tinged with red-brown, the fore legs dark brown, the tarsi ringed with white. Fore wing whitish suffused with red-brown and irrorated with blackish, the terminal area darker; a fine blackish subbasal line, excurred below costa;

antemedial line black, oblique towards costa, retracted in the cell, then sinuous; a small black spot at lower angle of cell; postmedial line black, oblique, sinuous, and defined on each side by white to vein 2, then retracted and almost obsolete to lower angle of cell and excurved above inner margin; a blackish subterminal shade; a maculate blackish terminal line; cilia white mixed with brown and with black line at middle. Hind wing whitish suffused with reddish brown and irrorated with blackish; a small black spot at lower angle of cell; postmedial line indistinct blackish slightly defined on outer side by whitish, oblique and slightly waved to vein 4, then retracted and with black spot on it at submedian fold, then almost obsolete; cilia white and brown with a black line at middle.

Hab. MEXICO, Guerrero, Omilteme (*H. H. Smith*), 1 ♂ type, Godman-Salvin Coll. *Exp.* 14 mm.

(1 a) *Stenia retractalis*, sp. n.

♀. Head, thorax, and abdomen red-brown mixed with black-brown and some white; antennæ pale red-brown; palpi red-brown, white at base; pectus, legs, and ventral surface of abdomen white, the legs slightly tinged with rufous. Fore wing whitish suffused with red-brown and irrorated with black-brown; antemedial line black defined on inner side by white, oblique towards costa, then straight and erect; a black spot in middle of cell and small white discoidal lunule defined by black; postmedial line black defined on outer side by white, incurved at discal fold, at vein 2 retracted to below angle of cell, then excurved to inner margin; a terminal series of black points; cilia white mixed with brown. Hind wing whitish tinged with red-brown and irrorated with blackish; postmedial line white defined on inner side by blackish, straight and erect to termen at vein 2, then retracted and obsolescent to lower angle of cell, then erect to tornus; a blackish terminal line; cilia white with a black line through them.

Hab. BR. GUIANA, Bartica (*Parish*), 1 ♀ type. *Exp.* 16 mm.

[To be continued.]

XXII.—*New Lepidoptera from Waigeu, Dutch New Guinea, and Biak.* By J. J. JOICEY, F.L.S., F.Z.S., F.E.S., and G. TALBOT, F.E.S.

THE species described in this paper were all collected by Messrs. A., C., and F. Pratt, and the types are in the collection of Joicey at the Hill Museum, Witley, Surrey.

Figures of all these will be published after the War.

Papilionidæ.

Papilio (Troides) goliath, Ob.

Ornithoptera goliath, Oberthür, Et. d'Ent. xix. p. 1, pl. iv. fig. 19 (1894). ♀.

The ♂ of this species, which we now describe, was taken by Messrs. A., C., and F. Pratt during their expedition to Waigeu in 1915, and is unique.

Compared with allied forms, it is distinguished by reduction of the green areas on the fore wing. In size and general appearance it is close to *samson*, Niep.*, from the Arfak. The green costal band is indented below vein 7 as in *supremus*, Rüb. The posterior green patch is much invaded by black, leaving a narrow distal portion, and inner marginal stripe, and green dusting in the area below vein 2. The hind wing is like *samson*, with the same relatively broad green outer margin to the yellow area, and absence of black scaling on the three discal spots.

The underside of the fore wing shows increased black in cellule 7 as compared with other forms. The small and separate black submarginal spots are as in *samson*. The hind wing is like the figured *samson*, except that whereas this form shows the whole base of cellule 8 scaled with green, in *goliath* there is but a trace of green at the extreme base.

In the Tring Museum there is a ♂ from the New Guinea coast opposite Waigeu, which, though not identical with the *goliath* here described, very closely approaches it and *samson*. More material is necessary to establish the racial distinctions of these forms. We have found that many butterflies from Waigeu are not racially different from specimens inhabiting the Arfak and north coast districts when a good series is compared. It is therefore probable, considering the greater powers of flight possessed by these *Papilio*, that *goliath* as a race extends over a wider range than the island of Waigeu.

It is curious that the ♀ of *goliath* figured by Oberthür is much nearer the *supremus* form from German New Guinea than it is to *samson* from the Arfak.

Pieridæ.

Delias ladas waigeuensis, subsp. n.

♂ ♀. Differs from typical form in the reduced apical

* *Ornithoptera samson*, Niepelt, Int. Ent. Zeit. vi. p. 281 (1913) (Arfak Mtns.); Lep. Niep. p. 54, pl. iii. fig. 1, ♂, pl. vi. fig. 1, ♀ (1913).

black on the fore wing; this is more apparent below, where the black margin does not continue below vein 2, except very slightly in the ♀, and the white spot in 4 is much larger.

Hab. Waigeu, Feb.-May. 7 ♂♂, 5 ♀♀.

Terias candida octogesia, Fruh.

♀-forma *biakensis*, f. n.

We propose the above name for the ♀ specimens of *octogesia* from Biak, all of which are darker yellow than ♀♀ from Waigeu.

We can find no difference between ♂♂ of *octogesia* from Waigeu and Biak (Schouten Is.).

Nymphalidæ.

Hypolimnas deois waigeuensis, subsp. n.

This form, especially the ♀, is near a race from Dampier Island.

The ♂ is distinguished from typical *deois*, Hew., in the strongly violet discal patch of the hind wing, which bears only some scattered white scales.

♀ is distinguished by the absence of white on the hind wing, the basal half being black-brown to beyond the cell, with a broad brown distal band bearing the usual ocelli. The white band of the fore wing is sprinkled with black-brown scales, and is ill-defined distally, being thus darker and less distinct than in other ♀ forms.

Hab. Waigeu, Feb.-March, 1 ♂, 1 ♀. Also a ♂ and ♀ in the Tring Museum.

Apaturina erminea octavia, Fruh., ♀.

The ♀ of this form departs from the ♀ colouring of *erminea* and resembles the ♂.

The spots of the subapical band are larger, and below the wings are paler.

Length of fore wing 47 mm.

Hab. Waigeu, 1 ♀, Feb.-March; 2 ♂♂, April-May.

Satyridæ.

Hypocysta osyris waigeuensis, subsp. n.

This is the first form of *Hypocysta* as yet discovered on Waigeu.

The fore wing above shows a more distinct and better-defined pale discal band than in *osyris* from Aru, and the veins are not scaled with brownish black. The hind wing has a more extended basal area.

On the underside the white area of the hind wing is only separated from the silvery edging of the ocelli by a thin brown line.

♀ with broader white band on fore wing, extending to vein 4. Hind wing with extended white, filling the basal part of cellule 2.

Hab. Waigeu, 3 ♂ ♂, 2 ♀ ♀, March-May.

Mycalesis arabella, Fruh., ♀.

Upperside of *fore wing* with brown area extended to the submarginal line in the area below vein 3 and also extending above this vein. The two ocelli below are reproduced above, as also is the heavy submarginal line. *Hind wing* paler than in the ♂.

Underside paler than in the ♂; abdomen grey-brown above, pale ochreous below.

Length of fore wing 23 mm.

Hab. Waigeu, 1 ♂, 1 ♀, April-May.

Subfamily NEMEOBIINÆ.

Prætaxila wallacei arfakensis, subsp. n.

Near the form *theodosia*, Fruh., from Dorey, but differs from this chiefly in the shorter white patch on the hind wing.

♂. Upperside of fore wing with three small white subapical spots. Hind wing with the white patch reaching vein 4 as in *wallacei*, but reaching below vein 2 nearly to the submedian, inner edge indented in 2 and 3, distal edge toothed.

Underside of fore wing as in *wallacei*. Hind wing with a faint discal curved line, not broken up as in *wallacei*; subterminal orange band narrower and bordering the row of five rounded black spots.

Hab. Angi Lakes, Arfak Mtns., 6000 feet, March 1914 (A., C., & F. Pratt), 1 ♂.

Lycænidæ.

Arhopala fulla babsi, subsp. n.

♂. Upperside as in *fulla*, Hew., from Amboina.

Underside with darker ground-colour and a purplish sheen

which is absent in *fulla*. The markings are similar, but the discal band of the hind wing is much broader.

♀. This sex of *fulla* does not appear to be known.

Fore wing above with costa and outer margin broadly black. *Hind wing* with broad costal and apical black margin reaching to below vein 6.

Underside as in the ♀.

Hab. Waigeu, 6 ♂♂, 2 ♀♀, Feb.—March.

Deudorix concolor, sp. n.

Allied to *woodfordi*, Druce*, from the Solomons, and not easily to be distinguished from it on the upperside.

♂. Underside as in *epijarbas*, Moore, but the lines in the anal area of the hind wing do not form an angle, and the outer part of the V-shaped mark normally present is separated in 1c to form an oblong closed spot. Some slight metallic blue scaling at the anal angle.

Upperside differs from the figure of *woodfordi* in the brown not extending above vein 2 on fore wing. *Hind wing* with brown area having basal edge incurved and not straight.

Length of fore wing 19 mm.

Hab. Waigeu, Feb.—March, 1 ♂.

Candalides philotas cineraceus, subsp. n.

Compared with *philotas*, Feld., from Amboina, of which we examined the type, this race is darker blue above and darker grey below. The blue patch on the fore wing of the ♀ is duller blue, and there is increased blue scaling in the cell of the hind wing.

Hab. Waigeu, 2 ♂♂, April—May; 3 ♀♀, Feb.—March.

There is a specimen of this form in the B.M.

Pepliphorus hylas waigeuensis, subsp. n.

♂. Distinguished from *hylas*, Cram., from the Moluccas, especially by the broad white band of the fore wing; this band reaches vein 4.

Underside of fore wing with white band extending above vein 4, its distal edge incised between the veins. Hind wing with subterminal line thinner and more strongly dentate: black anal spot not edged with a white line anteriorly, the white line at each side joined to the double V-shaped white line above it.

Hab. Waigeu, Feb.—March, 2 ♂♂.

* *Deudorix woodfordi*, Druce, Proc. Zool. Soc. 1891, p. 571, pl. xxxii. figs. 13, 14 (Guadalcanar).

Lampides pactolus waigeuensis, subsp. n.

Compared with *pactolus*, Feld., from Amboina, of which we have examined the type, this race has the ground-colour of the underside dull grey instead of brownish grey. The bands of the fore wing are straighter. On the hind wing the sixth line of white bars not joined to the fourth line of the discal band. The anal spot is very faintly edged with orange.

♀ with reduced blue on both wings and no subterminal spots. *Fore wing* with blue patch extending but slightly above vein 5 and filling basal half of cellules 2-4; a subterminal line from vein 4 to submedian formed of three blue lunules and cutting off three spots of ground-colour in cellules 1 *b-c*, 2, and 3.

On the underside the subterminal lines on both wings are thinner than in *pactolus*.

Hab. Waigeu, ♂ ♀, Feb.-March.

Hesperiidæ.

Subfamily *HESPERINÆ*.*Casyapa swinhoei*, sp. n.

Allied to *corvus*, Feld., but differs from all the previously known species in having a white line behind the eyes.

♂. Upperside rufous brown. Underside with dark brown ground-colour. *Fore wing* with costa rufous brown to the middle; basal area sparsely scaled with rufous brown. *Hind wing* with dark brown ground-colour and basal three-fourths scaled with rufous brown, leaving a dark marginal border. Fringes orange-yellow.

Antennæ, head, thorax, and abdomen as in *corvus*.

Length of fore wing 32 mm.

Hab. Waigeu, Feb.-March, 1 ♂.

Casyapa critomedia waigeuensis, subsp. n.

Casyapa critomedia subsp. n., Fruh. Iris, xxiv. p. 103 (1910) (Waigeu).

Distinguished from *critomedia*, Guér., from Papua, by the narrower orange-yellow bands.

♂ ♀. Upperside of *fore wing* with discal band reaching the submedian, narrowing from vein 4 and not projecting distad in cellule 3; a black dot within the band at base of 3 or no dot at all. *Hind wing* with a marginal black border narrowing posteriorly to 1 *b* or before it.

Hab. Waigeu, Feb.-March, 4 ♂ ♂, 3 ♀ ♀.

Subfamily ISMENINÆ.

Hasora latifascia, sp. n.

Allied to *discolor*, Feld., and *lugubris*, Bdv., but larger and with fore wing more produced apically.

♂. Upperside deep brown with a slight purplish sheen. *Fore wing* as in *lugubris*, without streaks of androconia. *Hind wing* as in *lugubris*, but with basal hair greenish.

Underside of *fore wing* similar to *lugubris*; dark blue gloss less extended below vein 4; subapical green line thicker and nearly straight. *Hind wing* similar to *discolor*, but ground-colour more bluish green and darker at the distal margin; the discal band white, its outer edge straight, its inner edge but slightly curved; marginal line obsolete.

♀. Underside of *fore wing* with an indistinct bluish-white median patch. *Hind wing* with band broader than in the ♂.

Antennæ black; palpi black-brown mixed with yellow; head dark brown, frons green; thorax dark green; abdomen above deep purplish brown, clothed with dark green hair at base, below black-brown; segments and anal tuft marked with grey-white; thorax below dark green; legs greyish brown, with dark green hair.

Length of fore wing 26 mm.

Hab. Biak, Schouten Islands, May and June, 2 ♂♂, 1 ♀ (types); Waigeu, April-May, 1 ♂.

Hasora chalybeata, sp. n.

Allied to *latifascia*, J. & T., but without the white band, and possessing in the ♂ two stripes of androconia on the submedian, 2, 3, and 4 of the fore wing.

♂. Underside of *fore wing* with more steel-blue than in *latifascia*, leaving the brown ground-colour only proximally below vein 2 and along the inner margin. *Hind wing* steel-blue with a greenish tinge; a trace of a pale and very narrow discal band.

♀. Upperside with a strong purple sheen over the costa and outer margin of fore wing and along outer margin of hind wing.

Length of fore wing 26 mm.

Hab. Waigeu, Feb.-March, 5 ♂♂, 1 ♀.

Subfamily *PAMPHILINÆ*.

Hesperilla arfakensis, sp. n.

Allied to *maykora*, Plötz, Berl. Ent. Zeit. 1885, p. 225 (Arn).

♂. Differs below in the much paler brown colour, with purple and green reflections; the fore wing with grey-white scaling in the median area below vein 2.

Length of fore wing 18 mm.

Hab. Angi Lakes, Arfak Mtns., 6000 feet, March, 1 ♂.

Sabera fusca, sp. n.

Allied to *fuliginosa*, Misk., from Australia, and chiefly distinguished by the shorter brand and the absence of spots on hind wing below.

♂. Upperside blackish brown. *Fore wing* with a line of androconia from the submedian to vein 4, widened in cellule 3 to fill the base of the cellule; at the distal edge of this brand are some scattered pale yellow scales occurring from the inner margin to vein 6, but variable in number; above this in 6, 7, and 8 are some faint streaks of darker yellow scaling, also some scattered yellow scaling along the costa and in the cell; slight yellowish hair along basal part of inner margin; fringe white at outer angle. *Hind wing* without markings; fringe white from anal angle to vein 6.

Underside dark chestnut-brown. *Fore wing* with basal and median area dark brown. *Hind wing* unicolorous except for some more distinctly reddish scaling below vein 2.

Antennæ black, club pale yellow beneath. Head and palpi black mixed with yellow-brown; abdomen black with some yellow or grey-white scaling laterally and ventrally; legs black-brown, more or less scaled with yellow.

Length of fore wing 16 mm.

Hab. Wandammen Mtns., 6000 feet, Nov. 1914, 6 ♂ ♂.

Sabera albicilla, sp. n.

Allied to the preceding species.

♂. Upperside black-brown. *Fore wing* with a line of androconia as in *fusca*, but placed at nearly right angles with the inner margin and composed of raised scales; a white dot at base of cellule 3; three subapical white dots placed close

together in cellules 6, 7, and 8. *Hind wing* without markings; fringe white to vein 6 or before it; outer margin more or less narrowly edged with white from anal angle to vein 2, this being most marked in the specimens from the Wandammen Mountains.

Underside of *fore wing* dark chestnut-brown along costa and over apical area, remainder black-brown; some bluish-white scaling along outer margin and the dots of the upperside showing through. *Hind wing* dark chestnut-brown; a large oval creamy-white spot below the cell, touching vein 2 and the submedian; below this a small white spot near the outer margin.

Antennæ black, club pale yellow beneath; palpi black above, white below and at the sides; head, thorax, and abdomen black, the abdomen with some grey-white hair on the ventral surface; pectus grey-white; legs black-brown, slightly scaled with yellow, femora with a fringe of grey-white hair.

Length of fore wing 15 mm.

Hab. Wandammen Mtns., 3000 feet, Nov., 1 ♂ (type); Angi Lakes, Arfak Mtns., 6000 feet, Jan.-Feb., 2 ♂ ♂.

Acerbas albimedia, sp. n.

Distinct from the other species of the genus.

♂. Upperside black-brown. *Fore wing* with a yellow inner marginal streak, slightly curved from near the base to above the submedian, this vein separating the spot above it; above this in one specimen is seen a faint yellow dot in 2. *Hind wing* with a narrow transverse discal band of five small spots placed in 1c, 2, 3, and 4.

Underside of *fore wing* black-brown, costa and apical area paler and with a greenish sheen; three small pale yellow median spots, one above vein 2, the others below it. *Hind wing* with base and distal margin grey-brown with a greenish sheen; a broad white discal band from the costa to inner margin, much broader below the submedian, so that nearly all the inner margin is white.

Antennæ black, club yellow below posteriorly; palpi and frons greenish yellow, vertex black; thorax and abdomen above black, some dark greenish hair on patagia and base of abdomen; abdomen below sulphur-yellow, with a thin mesial line of whitish hair; legs black and more or less scaled with yellow, femora with a fringe of grey-white hair.

Length of fore wing 18 mm.

Hab. Wandammen Mtns., 3000–6000 feet, Nov., 2 ♂ ♂.

We place this provisionally in *Acerbas*. The fore wing has vein 2 from near the base, 3, 4, and 5 all near together.

BIAKA, gen. nov.

Allied to *Pirdana*, Dist. Antennæ about three-fourths length of fore wing. *Fore wing* with vein 5 from below middle of discocellular, 3 close to 4 near angle of cell, 2 from below middle of cell; upper discocellular obsolescent, farther from 10 than in *Pirdana*. *Hind wing* with vein 5 from below middle of discocellular, its proximal half obsolescent, 4 from the angle, 3 from just below the angle, 2 opposite 6 and farther from 3 than in *Pirdana*.

Type, *albidiscus*, J. & T.

Biaka albidiscus, sp. n.

♀. Upperside black-brown with a strong purple sheen. *Fore wing* with a pale discal suffusion in areas 1 *b*, 1 *c*, 2, and 3, formed by a reduction of scales; some yellowish-brown hair below cell and on inner margin. *Hind wing* with some yellowish-brown hair in cell and in 1 *c*, and at the bases of 2, 3, and 4; a pale postcellular suffusion formed by reduced scaling.

Underside bronzy green. *Fore wing* with a small white discal patch formed of three spots in 1 *b*, 1 *c*, and 2; basal and median area bluish purple. *Hind wing* with a large bluish-white discal patch, extending from base along lower half of cell, anteriorly to vein 6 and posteriorly to the inner margin, its distal edge curved parallel to the outer margin.

Antennæ black, club with white scaling below. Head and palpi black-brown mixed with yellow, first and second palpal segments yellow at the side; thorax black-brown clothed with yellowish-brown hair; abdomen black-brown, with some greyish-brown hair on basal segment, laterally and ventrally with segments edged with white; legs black-brown on outside, ochreous on inside, femora whitish on inside.

Length of fore wing 23 mm.

Hab. Biak, Schouten Islands, June, 1 specimen.

We are indebted to Col. C. Swinhoe for kindly giving us his opinion on this very interesting species.

MIMENE, nom. nov.

Mimas, de Nicéville, Journ. Bomb. Nat. Hist. Soc. vol. ix.

p. 391 (1895), is preoccupied by *Mimas*, Hübner, Verzeichniss, p. 142 (1822).

We therefore propose the name *Mimene* for this genus. Beside the species here described, the following two are known, but are not mentioned by Mabille in the 'Genera Insectorum':—

Mimene (Ismene) miltias, Kirsch, Mitth. K. Zool. Mus. Dresden, vol. i. pt. 2, p. 128, pl. vii. fig. 6, ♀ (1877) (Jobi Island). Type of genus.

Mimene (Mimas) miltias, de Nicév., J. B. N. H. Soc. vol. ix. p. 393, ♂ (1895) (Humboldt Bay).

Mimene (Mimas) melie, de Nicév., J. B. N. H. Soc. vol. ix. p. 394, pl. Q, fig. 55, ♀ (1895) (Humboldt Bay).

Mimene basalis, J. & T., ♂.

Mimas basalis, Joicey & Talbot, Trans. Ent. Soc. Lond. 1916, p. 80 (Schouten Is.), ♀.

♂. Upperside with metallic bluish-green scaling in the basal areas. *Fore wing* with basal patch extended but slightly into the cell. *Hind wing* with basal patch extended beyond cell between veins 4 and 5, and mostly covered with white hair.

Underside as in ♀ and with a blue spot on vein 5. *Hind wing* as in ♀ and with a brown discal spot and a quadrate blue postcellular spot in 4.

Fore and hind tibiae with a fringe of hair, black on the former, and on the latter black anteriorly and white posteriorly.

Length of fore wing 18 mm.

Hab. Waigeu, Feb.—March, 2 ♂ ♂.

Mimene biakensis, sp. n.

♂. Upperside with stigma not wavy, but straighter than in *waigeuensis*; yellow discal band much reduced and scarcely indicated below vein 2.

Underside of *fore wing* unicolorous, without median yellow patch which is present in *waigeuensis*.

♀. Upperside with only faint yellow scaling in the median and basal areas of fore wing. *Hind wing* without discal spots.

Underside of fore wing with a small yellow discal patch below vein 2.

Hab. Biak, Schouten Is., June, 3 ♂ ♂, 3 ♀ ♀.

Mimene wandammenensis, sp. n.

Allied to *biakensis*, but has not in the ♂ the sex-brand of the fore wing complete.

♂. Upperside black-brown. *Fore wing* with sex-brand limited to a small stripe on the anterior sides of the submedian and vein 2, and on both sides of 3; an indistinct band formed of scattered yellow scaling on the line of the androconia; a thin yellow basal stripe on inner margin; some yellowish hair below the cell. *Hind wing* with a very indistinctly yellowish basal stripe extending to beyond the cell. Cilia pale yellow from anal angle to vein 4.

Underside deep purplish brown with a greenish reflection, and no markings.

Head and palpi black with sparse yellow scaling; antennæ lost; thorax and abdomen black, some blackish-brown hair at the base of latter; legs and pectus black-brown.

Length of fore wing 19 mm.

Hub. Wandammen Mtns., 3000-4000 feet, Nov., 1 ♂.

Mimene waigeuensis, sp. n.

♂. Upperside with blackish-brown ground-colour. *Fore wing* with a thin yellow-brown discal band from the submedian to vein 4, crossed by the dark veins, and edged proximally by a line of androconia; the androconia form a wavy continuous line which becomes thickened in the base of cellule 3 to fill the interspace; below the cell in 2, 1 c, 1 b, and 1 a some yellow-brown basal scaling. Fringe black-brown, yellowish at outer angle. *Hind wing* with a yellow-brown transverse band interrupted by the veins to form four spots, the two middle ones being the larger; some dark yellow-brown hair in the cell and along inner margin; fringe black-brown, yellow-brown between anal angle and vein 5.

Underside black-brown with a deep purplish sheen, fore wing paler than the hind wing. *Fore wing* with a yellow discal patch placed between submedian and vein 3, its inner edge better defined than the outer. *Hind wing* without markings.

Antennæ black, with some grey-white scaling on the lower surface of the club. Head and palpi black-brown mixed with yellow; thorax black-brown, clothed with dark yellow-brown hair; abdomen black, with dark yellow-brown hair at base, segments edged basally with dark grey above

and yellow-brown below; legs black-brown, mid and posterior femora grey-white on inside.

♀. Upperside of *fore wing* with narrow pale yellow discal band of three spots between submedian and vein 2; some pale yellow scaling along proximal half of inner margin. *Hind wing* with paler markings than in the ♂, and with a shorter discal band.

Underside of *fore wing* with a broader discal patch than in the ♂.

Head and palpi with yellowish-white markings. Fringes black-brown.

Length of *fore wing*, ♂ 20, ♀ 21 mm.

Hab. Waigeu, Feb.-May, 6 ♂ ♂, 1 ♀.

Mimene viridicincta, sp. n.

Distinguished from other species of the genus by the metallic green head.

♂. Upperside with black-brown ground-colour. *Fore wing* with the basal area to origin of vein 3 yellow-brown divided by the dark veins and with the cell but sparsely scaled with this colour. *Hind wing* with some yellow-brown hair at the base.

Underside of *fore wing* with a yellow-brown spot at the base of cellule 2 and some scaling of similar colour above it in the cell. *Hind wing* darker than the *fore wing*, deep brown and without markings.

Antennæ black, club greyish below with yellow scaling; head, palpi, tegulæ, and base of patagia metallic green with cupreous reflections; thorax and base of abdomen clothed with yellow-brown hair; abdomen deep purplish brown with slight yellow lateral scaling; anal tuft white below; legs black-brown.

Length of *fore wing* 21 mm.

Hab. Waigeu, Feb.-March, 1 ♂.

We place this provisionally in *Mimene*, but it differs from the typical ♂ of that genus in veins 3 and 4 of the *fore wing* originating close together and 3 and 4 of the *hind wing* being closer together than 2 and 3.

Notocrypta angiana, sp. n.

Allied to *wokana*, Plötz*, from Aru, but differs in having the spot in 2 on the *fore wing* reduced proximally so that its inner edge is not in line with the cell-spot; the band is

* Berl. Ent. Zeit. xxix. p. 225 (1885).

narrower than in *wokana*, of which there is a good series in the Hill Museum from Aru.

Hab. Angi Lakes, Arfak Mtns., 6000 feet, March, 1 ♀.

Geometridæ.

Celerena perithea waigeuensis, subsp. n.

Nearest the race *keiensis*, Prout.

♂ ♀. Palpus above with second segment scaled with yellow to near the apex. *Fore wing* with distal edge of yellow basal area nearly straight; below, this area is diffuse below the cell, the inner margin in the ♂ being but narrowly edged with yellow.

Hab. Waigeu, Feb.-May, 5 ♂♂, 9 ♀♀.

Craspedosis cyanodes, sp. n.

Nearest to *cyanauges*, Prout, Nov. Zool. vol. xxiii. p. 72 (1916) (Mount Goliath, Cent. Dutch New Guinea).

♂. Larger than *cyanauges* and with a duller blue colour. The white stripe on the fore wing is longer and extends from vein 9 to below 2. On the underside the colour is scarcely different from *cyanauges*.

Length of fore wing 20 mm.

Hab. Wandammen Mtns., 6000 feet, Nov., 1 ♂.

Craspedosis cyanophanes, sp. n.

Allied to *cyanauges*, Prout, but the blue not extended to the margins. *Fore wing* with white stripe reduced, thinner, and extending from vein 6 to below 3. On the underside the blue reflections are brighter than in *cyanauges*.

Length of fore wing 16 mm.

Hab. Wandammen Mtns., 3000-4000 feet, Nov., 1 ♀.

Uraniidæ.

Urapteroides swinhoei, sp. n.

Near *approximans*, Swinh., from Shortland Island, but the dark margin of the fore wing is broader, especially at the apex, and on the hind wing the outer band is broader, its pale posterior part being nearly merged into the discal band.

Length of fore wing 30 mm.

Hab. Waigeu, Jan., 1 ♂; Feb.-March, 2 ♂♂.

XXIII.—*Two new Species and new Genus of Sphingidæ.*

By J. J. JOICEY, F.E.S., and W. J. KAYE, F.E.S.

[Plate VIII.]

Polyptychus lapidatus, J. & K.

♂. Differs from *P. murinus*, Roths. (1904), in the following points:—

Smaller; distal margin of fore wing a little less incurved and darker brown than in *P. murinus*, the ante- and postmedian lines less irregular, the antemedian ones ending at hind margin, with a conspicuous brown spot composed of two areas; the postmedian lines, which in *P. murinus* are crenate or dentate in front of the hind margin, being strongly marked in this area, are in *lapidatus* feebly marked, not contrasting much with the ground, a somewhat diffuse brown spot at hind margin near angle being the most conspicuous marking in this area. Anal angle of hind wing less produced than in *P. murinus*, the apex of hind wing broader, the brown anal submarginal spot continued forward.

Underside: costal margin of fore wing and the hind wing with the exception of the distal and abdominal marginal areas laved with ferruginous, almost as in *P. murinus*; fore wing with a somewhat dentate postdiscal line, and further towards margin two rows of minute dots, the inner dots being connected with one another by a very faint brown line. On hind wing three brown lines:

Genitalia similar to those of *P. murinus*, but anal tergite slenderer and comparatively larger. The clasper (fig. 2) with a small, well-defined patch of small yellowish scales on the outside near apex; the upper process of the harpe (P^1) directed obliquely downwards, very much shorter than the corresponding process of *P. murinus*; moreover, in *P. murinus* P^1 is almost horizontal, being directed towards the apex of the clasper, which it reaches; process P^2 is denticulate and touches P^1 apically; below P^2 there is a short lobe L. The penis-funnel is armed below the penis-sheath with two conical thorn-like teeth which are curved upwards; in *P. murinus* the two prongs of this fork are almost divaricate, while in *lapidatus* they are divergent. (For the meaning of these termini see Lacordaire, *Genera Coléopt.* ix. 2, p. 412, 1872.) The genitalia of two ♂♂ of *P. murinus* have been compared, one from the Congo, the other from the Gold Coast.

Hab. W. Africa, Coomassie.

1 ♂.

Expanse 64 mm.

Type in Coll. Joicey.

We are greatly indebted to Dr. Jordan for his diagnosis and drawing of the genitalia of *Polyptychus lapidatus*.

THIBETIA, gen. nov.

Head large, projecting, with a mesial crest. Antennæ of ♂ long and heavy, with short pectinations, ending in a long gradually tapering tip. Palpi large, projecting considerably, the second joint much larger than the first. Two pairs of spurs on hind tibia of nearly equal length, long. Mid and hind tarsus with comb. Curved spur of fore tibia very strong. Wings short. Apex of fore wing very obtusely pointed and sharply curved before apex. Outer margin strongly convex before middle and concave before vein 3, and again but less so at vein 5. Lower angle of cell nearly a right angle with median. Hind wing without lobe at anal angle.

Type, *T. niphaphylla*.

This genus is close to *Angonyx*, from which it chiefly differs in having spurs of nearly equal length on the hind tibia, a short body, and a mesial crest on the head.

Thibetia niphaphylla, sp. n.

Above: Head, thorax, abdomen, and fore wing dirty blackish brown. Fore wing with the first three transverse lines pointing basad, the outer one double the width of the two nearer ones. Discal line nearly straight, passing just beyond end of cell. Two waved postdiscal lines. A sub-apical shade of reddish ochreous. A dark brown shade cutting off a large apical area. Hind wing dirty blackish brown or reddish brown, with a darker border, widest between veins 4, 5.

Below: Base of palpi, breast, abdomen, and large discal area of both fore and hind wing dull reddish. A very irregular brown marginal band, widest at vein 5, on both fore and hind wing. A pair of ill-defined curved lines across the disc of hind wing.

Expanse 52 mm.

Hab. Thibet.

1 ♂, 3 ♀ ♀.

Type in Coll. Joicey.

EXPLANATION OF PLATE VIII.

Fig. 1. *Polyptychus lapidatus*.

Fig. 2. Ditto. Clasp of genital armature.

Fig. 3. *Thibetia niphaphylla*.

XXIV.—*Remarks on certain Species of the Genus Demodex, Owen (the Demodex of Man, the Horse, Dog, Rat, and Mouse).* By STANLEY HIRST.

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[Plate IX.]

Demodex folliculorum, Simon.

Elongated specimens of *Demodex folliculorum* (from human beings) are from five and a half to over six and a half times as long as the width of the cephalothorax*, the latter (including capitulum) being about a quarter of the total length in large specimens. Capitulum short, being much wider than long; the two spines on its dorsal surface are very short and inconspicuous.

This species is apparently the longest of the genus, adult females sometimes measuring up to 390 μ in length.

Demodex caninus, Tulk.

D. caninus is an elongated species, being usually more than six (sometimes up to seven) times as long as wide. The cephalothorax (not including capitulum) is a little less than half the length of the abdominal part of the body and is of moderate width. Abdomen long and slender, gradually tapering to the posterior end, which is bluntly pointed. Capitulum of moderate width, being widest at the base, where it about equals its length; the two spines on its dorsal surface are very short and pointed.

Measurements.—Length of body 225 μ ; width of cephalothorax 40 μ .

Material.—Numerous specimens from a dog suffering from the disease induced by this species of *Demodex*.

Note.—My adult females of *D. caninus* do not measure more than 225 μ , whereas Canestrini states that his examples of this sex measure up to 302 μ ; from this it would seem that this species varies considerably in length when adult.

* The word "cephalothorax" is used here to indicate the anterior part of the body bearing all the four pairs of legs. It is, perhaps, necessary to make this point clear, for the last pair of legs in the genus *Demodex* sometimes has the appearance of being placed on the "abdomen"; this is due to the fact that the transverse striations (or annulations) characteristic of the posterior region of the body extend dorsally beyond this pair of legs (or even further forwards in some species).

Demodex ratti, Hahn.

♀.—This species is long and slender, being about seven and a half to eight and a half times as long as the width of the cephalothorax. Capitulum narrow, being longer than wide. Cephalothorax also characteristically narrow and much shorter than the abdomen; the latter is wider, but fairly long and vermiform. The two spines on the dorsal surface of the capitulum are well developed and fairly long; they are curved near the base and pointed at the end.

Measurements.—Length of body (including capitulum) 237 μ ; width of cephalothorax 27 μ , of abdomen 36 μ .

Fig. 1.

*Demodex ratti*, Hahn. Dorsal view of capitulum.

Material.—I have examined two adult female specimens collected by Leslie Linzell from a wild rat (*Rattus norvegicus*). Mr. Linzell informs me that the parasites were very abundant in the skin of this rat.

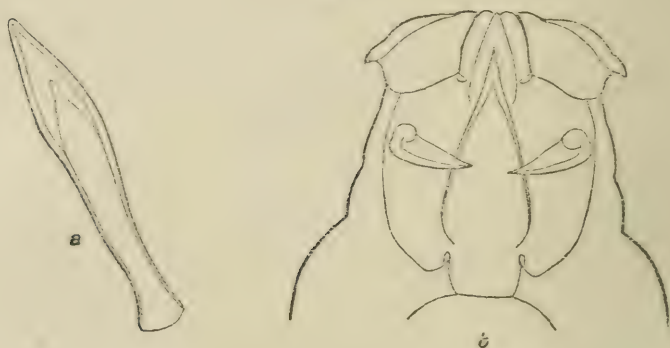
Demodex musculi, Oudms.

The adults of this species are rather short. Cephalothorax + capitulum a little shorter than abdominal part of body. Capitulum of moderate width, being widest at the base, where it is about equal to the length. Distal end of capitulum (palp) with the outer angle strongly salient laterally and

pointed. Spines on dorsal surface of capitulum quite long and pointed at the end. Cephalothorax fairly wide. There is an internal chitinous structure in one of the specimens which seems to be a penis; it is shaped as figured (text-fig. 2 *a*).

Besides a few adult specimens, I have been able to mount and examine two examples of a much more elongated form, which is apparently a nymph (although very much larger than any adults of this species so far collected, no traces of the genital opening can be detected). The body (including capitulum) of this nymphal form is about seven and a half times as long as the width of the cephalothorax. Its abdomen is rather more than two and a half times the length of

Fig. 2.



Demodex musculi, Oudms. *a*, penis; *b*, dorsal view of capitulum.

the cephalothorax + the capitulum. Pl. IX. fig. 2, gives a good idea of the appearance of this elongated form, but the length is shown a little too short. The legs are rudimentary in this nymph, and their structure is difficult to ascertain with certainty; there are also four pairs of small rounded structures near the middle line, which are, perhaps, the basal segments of the developing legs of the adult.

Measurements.—♀. Length of body (including capitulum) $150\ \mu$; width of cephalothorax $22\text{--}38\ \mu$. Length of body of ♂ $125\ \mu$, of large nymphal form $235\ \mu$; width of cephalothorax $30\ \mu$.

Material.—Four tame mice were examined, and the *Demodex* was discovered in three of them, but the parasites were very few in number.

Demodex equi, Raill.

♀.—This species is much wider than is usually the case in the genus, the width (in mounted specimens) being about a third of the total length of the body. Cephalothorax + capitulum longer than abdomen; the latter has the posterior end widely rounded off or else bluntly pointed. Capitulum distinctly wider than long; the two rolls on its dorsal surface are not very long, but stout and blunt at the end.

Measurements.—Length of body (including capitulum) 200–220 μ , its width 68–70 μ .

Material.—I have examined two adult female examples of this species from English horses (Leslie Linzell's collection).

This *Demodex* causes a definite skin disease in horses.

EXPLANATION OF PLATE IX.

Fig. 1. *Demodex ratti*, Hahn. Ventral aspect.

Fig. 2. — *musculi*, Oudemans, nymph. Ventral aspect.

Fig. 3. — —, female. Ventral aspect.

XXV.—*Descriptions and Records of Bees*.—LXXVI.

By T. D. A. COCKERELL, University of Colorado.

Hoplitis anodontura, sp. n.

♂.—Length about 10 mm.; anterior wing 7.

Robust, black, with mostly white hair, but on vertex, disc of mesothorax, and abdominal segments 2 to 4 (except the apical bands) it is pale ochreous; facial quadrangle longer than broad, face densely covered with white hair; antennæ short, looking like those of a female, the flagellum red beneath except at base; vertex and cheeks with strong dense punctures, but shining between the punctures; mesothorax and scutellum very densely punctured; area of metathorax polished and shining; tegulae shining black. Wings strongly infuscated, brownish, the b.n. meeting t.m., and second s.m. long. Legs black, punctured, with glittering white hair; inner side of tarsi with pale reddish hair. Abdomen shining, but very well punctured; segments 1 to 5 with entire, narrow, white hair-bands; sixth segment very broadly rounded and at sides obtusely angulate, but not toothed.

Mexico (C. F. Baker Collection, 2499).

Compared with *H. adunca*, the type of the genus, this

species differs principally as follows:—Sixth abdominal segment without lateral teeth; flagellum normal, not especially thickened; mesothorax more coarsely and densely punctured; hind femora and tibiæ stouter. There is no material difference in the venation. The species is more like the European *H. adunca* than the species of the United States.

Pasiphaë cyanea melanura, subsp. n.

♀.—No red hair at end of abdomen, that on each side of apical plate greyish black (sooty); tegulæ shining black. Wings quite dusky.

Chubut, Patagonia (from W. F. H. Rosenberg). U.S. National Museum. The typical form is from Tierra del Fuego, about 600 miles southward.

Nomada carcaranensis, sp. n.

♂.—Length 10 mm.

Robust, with white pubescence in supraclypeal region, on sides and posterior part of thorax, and underside of abdomen. Head bright ferruginous, with the clypeus, very large cuneiform lateral marks, malar space, and base of mandibles light lemon-yellow; face broad, inner orbits practically parallel; mandibles simple; labrum red, very hairy; eyes pale reddish grey; face and front with coarse punctures, but a smooth line down middle of clypeus; scape bright ferruginous; flagellum ferruginous, strongly suffused with blackish above, except at base; third antennal joint much longer than fourth, but not quite so long as fourth and fifth combined; region of ocelli blackened; mesothorax red, with a strong median channel, which is blackish; surface of mesothorax shining, with very large, irregular, partly confluent punctures; axillæ and the bilobed scutellum brighter red than mesothorax; yellow band on prothorax, and the tubercles, two spots on pleura, and line on postscutellum also pale yellow; sides of thorax blackened, but middle of mesopleura red; metathorax red, with the basal area black; tegulæ bright ferruginous, with scattered punctures. Wings brown, with a median hyaline area; nervures dark fuscous, stigma ferruginous; b. n. meeting t. m.; second s. m. large, quadrate, receiving first r. n. slightly beyond middle. Abdomen shining, finely punctured; first segment basally red, then reddish black, and the margin with a yellow band; remaining segments reddish black, the second with a pale yellow band, broad at sides and narrow in middle, the third with only a slight mark on each

side, the fourth to sixth with pale bands, on fourth slightly interrupted, on fifth entire, on sixth widely interrupted, and emarginate on each side anteriorly; apical plate broad, truncate, finely longitudinally striate; venter without yellow markings.

Carcarana, Argentina (*L. Bruner*, 66).

Related to *N. pampicola*, Holmberg., but much larger, with red head and thorax. The type is in U.S. National Museum.

Nomada barcelonensis, nom. nov.

Nomada excellens, Pérez, 1913 (not Ckll. 1903).

Barcelona, Spain.

Augochlora (Odontochlora) thetis (Schrottky).

San Bernardino, Paraguay (*K. Fiebrig*). Collected Nov. 2.

Diadasia imitatrix (Schrottky).

San Bernardino, Paraguay (*K. Fiebrig*).

Megachile stomatura, sp. n.

♂.—Length about 8.5 mm.

Rather narrow, with nearly parallel-sided but not much elongated abdomen. Black, the small joints of tarsi ferruginous, and anterior femora with a large, polished, shining, ferruginous surface on inner side, occupying about the apical two-thirds. Head broader than thorax; face (except upper part of clypeus) and cheeks covered with white hair, that on face faintly yellowish; clypeus with rather large punctures on a shining ground; maxillary palpi very short; antennæ long and slender, reaching extreme base of abdomen; flagellum obscurely brown beneath; metathorax and sides of thorax with long white hair, dorsal surface with little hair, on mesothorax short, thin, and brown, but there is a band of white hair on postscutellum, a thin band in scutello-mesothoracic suture, and a conspicuous white tuft on each side of mesothorax posteriorly; mesothorax and scutellum dullish, the former with small weak punctures, distinctly separate on disc; tegulæ piceous, reddened posteriorly. Wings brownish hyaline, with a dark cloud from region of stigma along marginal cell to apex, darkest at end of marginal cell. Anterior coxæ without spines; anterior tarsi simple; hind tibiæ posteriorly covered with white tomentum, conspicuous in an

oblique light. Abdomen shining, basal transverse depressions of second and third segments very deep; segments 1 to 5 with narrow, entire, white hair-bands; fifth segment with short but coarse black hair before the band; sixth segment dorsally rugose, not tomentose, but with erect black hairs, the apical keel strongly bilobed, the large subtriangular lobes convex on outer margin and slightly concave within, the whole suggesting the opened mouth of some bird or fish; no subapical ventral armature.

Trinidad, West Indies, June 6 (*Aug. Busck*). U.S. National Museum.

A very distinct little species, superficially like *M. multidentis*, Fox, from Jamaica, but structurally quite different. The obscure reddish stigma is quite well developed, whereas that of *multidentis* is obsolete. The real affinity seems to be with such species as *M. disparipennis*, Ckll., from Texas, and *M. perpunctata*, Ckll., from Mexico. These latter have the darkening of the marginal cell and adjacent parts much more intense.

Megachile holomelena, sp. n.

♀.—Length 12 mm.; anterior wing 8 mm.

Black, robust, the body and pubescence entirely black, the flagellum very obscurely brownish beneath; mandibles broad, obtusely quadridentate; clypeus short and broad, densely punctured but glistening, the lower margin in middle smooth and polished, the edge straight and without any denticle; supraclypeal area smooth and shining in middle; mesothorax very finely and closely punctured, not shining; scutellum shining on disc, but well punctured; tegulæ black. Wings brownish hyaline, a dark shade along costal side of marginal cell. Spurs of anterior tibiæ red. Abdomen shining, last ventral segment truncate-subemarginate.

Chubut, Patagonia (from W. F. H. Rosenberg). U.S. National Museum.

The hair on inner side of tarsi is black, not red as in *M. chubutana*, Schrottky. The insect is smaller than *M. melancholica*, Joerg., the wings are not yellowish, and the abdomen is much more hairy dorsally, especially toward the base.

Megachile atramentata, sp. n.

♀.—Length 12 mm.; anterior wing 9 mm.

Black, robust, the body, antennæ, and tegulæ wholly black; the pubescence black, very obscurely reddish on inner

side of tarsi; appearance exactly like *M. holomelena*, but differing thus:—Lower margin of clypeus slightly crenulate; median line of clypeus in middle shining, more or less free from punctures; punctures of clypeus more distinct; mesothorax with much larger punctures, well separated on disc posteriorly. Wings darker, especially the upper part of marginal cell; second s.m. larger; b.n. almost meeting t.-m.

Bahia Blanca, Argentina (*L. Bruner*, 4). U.S. National Museum.

The abdominal scopa is pure black, not brown-black as in *M. chubutana*.

The following key separates five black species which look very much alike:—

- | | |
|--|---|
| Hair of face (male) pure white except at sides; abdomen closely punctured | <i>piurensis</i> , Ckll. (Peru.) |
| Hair of face (females only known) without any white | 1. |
| 1. Ventral scopa light orange-fulvous except at apex | <i>huascari</i> , Ckll. (Peru.) |
| Ventral scopa black, whitish in middle; mesothorax entirely dull | <i>eulaliæ</i> , Ckll. (Peru.) |
| Ventral scopa wholly black | 2. |
| 2. Mesothorax with dense very fine punctures. Mesothorax with large well-separated punctures on disc posteriorly | <i>holomelena</i> , Ckll.
<i>atramentata</i> , Ckll. |

Megachile bruneriella, sp. n.

♂.—Length 10.5 mm.

Rather broad, but parallel-sided; black, including the legs and the long slender antennæ; face densely covered with cream-coloured hair; underside of head with long white hair; vertex with black hair; mesothorax mostly dull, but shining on disc, closely but rather weakly punctured; scutellum closely punctured, but glistening; mesothorax above with long hair, mostly white, but black on disc of mesothorax and most of scutellum; pleura with black hair, but venter with white, and a tuft of white close to base of wings; metathorax with black hair, but postscutellum with white; tegulæ piceous. Wings strongly suffused with brown. Anterior femora with a red area on inner surface; anterior tibiæ reddened behind; anterior tarsi obscurely reddish, rather robust, not modified, with a posterior white fringe a little longer than width of tarsi; anterior coxæ with very short pointed spines; middle tarsi with shining creamy-white hair on outer side and long hairs behind; hind tarsi with red hair on inner side. Abdomen short, the sixth segment vertical; first segment with long whitish hair, the others with ochreous

hair (no black), the second with pale ochreous bands at sides, the third with similar bands less widely interrupted, the fourth with an entire pale band, the fifth covered with pale reddish hair, the sixth with creamy appressed hair; keel of sixth segment broadly rounded, the margin irregularly sub-crenate but not dentate, the central emargination moderate; no ventral spines.

Carcarana, Argentina (L. Bruner, 44). U.S. National Museum.

In the tables of Jörgensen and Schrottky it runs nearest to *M. parsonsiæ*, from which it differs by the small coxal spines, non-dentate end of abdomen, &c. It runs out at 13 in Vachal's table, and in Friese's Argentine table it goes to "*M. simillima*" = *parsonsiæ*. It is related to *M. paraxanthura*, Ckll., but differs in the distribution of the hair on the abdomen and the dark spurs. Other species of *Megachile* taken by Bruner at Carcarana are *M. infima*, Vachal (69); *M. ctenophora*, Holmbg., apparently (70); *M. gomphrence*, Holmbg., apparently (45); *M. vagata*, Vachal (43); *M. mendozaana*, Ckll. (63). The *Megachile* fauna of Argentina is very large, and as many of the species have been briefly described and many are known only from one sex, the determination of the species is more or less difficult and uncertain. The species must be quite local in many cases; thus, Vachal described nine species from the Province of Mendoza, and Jörgensen subsequently reported twenty species from that province, but did not meet with any of Vachal's.

· *Xylocopa frontalis nitens* (Lepeletier).

Apis morio, Fabr., 1793, is preoccupied by *Apis morio*, Swed., 1787; the insect consequently takes the name *nitens* (*Xylocopa nitens*, Lep., 1841).

Agapostemon heterurus, sp. n.

♀.—Length about 10 mm.; anterior wing 7.8 mm.

Head and thorax a rather bluish green, the strongly striate cheeks steel-blue; face broad, eyes emarginate; mandibles pale yellow basally; clypeus black except basally, convex, punctured, with a deep median sulcus; supraclypeal area varying from brassy to bluish; flagellum ferruginous beneath; mesothorax and scutellum covered with short, felt-like, ferruginous hair; base of metathorax coarsely wrinkled, the triangular area distinguishable; posterior face coarsely transversely grooved; tegulae reddish brown. Wings dusky, especially at apex; first r.n. joining second s.m. about

beginning of last third. Legs black, the anterior and middle knees and anterior tibiæ in front pallid; hind tibiæ and tarsi with dark fuscous hair on outer side and shining pale yellowish on inner; hind spur with two lamelliform teeth, the first very large. Abdomen honey-colour, with transverse black bands across middle of segments, that on first sometimes incomplete, the first also with two dusky spots anteriorly and a dark mark on each side; apical part of segments 2 to 4 with appressed orange hair; caudal rima yellowish, but black hair on each side of it.

Palcazu, Peru (from Rosenberg). U.S. National Museum.

Related to *A. vulpicolor*, Crawford, but the abdomen is quite differently coloured and the base of metathorax is much more coarsely sculptured.

Agapostemon tyleri, sp. n.

Almost exactly like *A. viridulus*, Fabr., in nearly all characters, and running to that in published tables, but distinct in the following characters:—

♀ (type).—Tegulæ black, with a yellow mark in front; scutellum finely and closely punctured all over; base of metathorax behind sides of enclosure without distinct grooves or striæ directed meso-caudad.

♂.—Tegulæ chestnut-red, with a yellow spot; yellow band on first abdominal segment broadly interrupted; hind femora and tibiæ on upper (inner) side broadly banded with black for their whole length; anterior tibiæ mainly black behind.

San Juan Allende, Mexico, Nov. 29 (*C. H. T. Townsend*). U.S. National Museum.

XXVI.—Notes on the Braconidæ in the British Museum.—I.

By ROWLAND E. TURNER, F.Z.S., F.E.S.

Subfamily BRACONINÆ.

Chaoilta decorata, Szép.

Blastomorpha decorata, Szép. Term. Füzetek, xxiii. p. 50 (1900).

Chaoilta decorata, Szép. Wytsman's Genera Insect. xxii. p. 17 (1904).

This species was originally described from Dutch New Guinea. I took a specimen at Cooktown in November 1904.

Genus CRATOBRACON, Cam.

Cratobracon, Cam. Proc. Zool. Soc. London, p. 226 (1901).

Hybothorax, Szép. Ann. Mus. Nat. Hungar. iv. p. 556 (1906) (nec (Ratsb.).

Szépligeti places Cameron's genus in the Doryctinae, merely quoting Cameron's description, not having seen the type. I have recently examined the type-specimen of *C. ruficeps*, Cam., and find that it is congeneric with *Hybothorax caudatus*, Szép.

Ceratobracon caudatus, Szép.

Iphiaulax caudatus, Szép. Termes. Füzetek. xxiv. p. 375 (1901). ♀.

Iphiaulax reticulatus, Cam. Jouru. Straits Br. Roy. Asiat. Soc. xxxix. p. 105 (1903). ♀.

Hybothorax caudatus, Szép. Ann. Mus. Nat. Hungar. iv. p. 556 (1906). ♀.

Szépligeti places his genus *Hybothorax* in the Braconinae, and does not notice that the nervulus is not interstitial with the basal nervure, but received distinctly beyond it, according to which character the genus should be placed in the Exothecinae according to his own tables. I do not think that a character which is so variable in degree can be used as the sole character for a subfamily, and therefore retain the genus in the Braconinae. Cameron states that the transverse basal nervure is interstitial, but this is incorrect.

Ipobracon insidiator, Fabr.

Ichneumon insidiator, Fabr. Spec. Insect. i. p. 429 (1781).

Bracon insidiator, Fabr. Syst. Piez. p. 108 (1804).

Iphiaulax speciosissimus, Szép. Ann. Mus. Nat. Hungar. iii. p. 31 (1905).

Ipobracon speciosissimus, Szép. Ann. Mus. Nat. Hungar. iv. p. 562 (1906).

Hab. Sierra Leone ; Ashanti.

The type is in the Banksian collection. Dalla Torre gives the locality erroneously as Europe.

Bathyaulax plumosus, Kirby.

Bracon plumosus, W. F. Kirby, Ann. & Mag. Nat. Hist. (6) xviii. p. 262 (1896).

Iphiaulax cristatus, Szép. Ann. Mus. Nat. Hungar. iii. p. 30 (1905).

Bathyaulax cristatus, Szép. Ann. Mus. Nat. Hungar. iv. p. 559 (1906).

Iphiaulax fastidiator, Fabr.

Ichneumon fastidiator, Fabr. Spec. Insect. p. 428 (1781).

Bracon fastidiator, Fabr. Syst. Piez. p. 105 (1804).

Bracon corallinus, Rits. Tijdschr. v. Entom. xvii. p. 179 (1874).

The type in the Banksian collection is headless, but the description gives the head as red with a black mark on the vertex. Dalla Torre is probably correct in giving *coccineus*, Brullé, as a synonym, but I am not sure that the North-African form identified by Marshall as *fastidiator* is really this species. Specimens in the British Museum are from the Gambia and Sierra Leone, from the latter of which localities some of the African species in the Banksian collection seem to have been received.

Iphiaulax plurimacula, Brullé.

Bracon plurimacula, Brullé, Hist. Nat. Insect. Hymen. iv. p. 429 (1846).

Iphiaulax coccineomaculatus, Cam. Ann. S. Afric. Mus. v. p. 46 (1906).

Iphiaulax permutans, sp. n.

♀. Fusco-rufa; capite flavo, antennis, pedibus, terebraque nigris; alis nigris, dimidio apicali flavo late bivittatis; stigmate flavo, apice extremo nigro.

Long. 13, terebra 9 mm.

♀. Front below the antennæ punctured-rugulose, with a small, smooth, semicircular area above the clypeus. Antennæ as long as the whole insect, the scape less than twice as long as broad; hind margin of the head widely emarginate. Thorax smooth, the parapsidal furrows distinct. First tergite as broad at the apex as long; the elevated median portion longitudinally striated, with a strong median carina; second tergite transverse, more than twice as broad at the apex as long, longitudinally striate, with three small smooth spaces on the anterior margin, but without a raised basal area. Third and fourth tergites longitudinally striate-rugose, the anterior angles raised and smooth, the remaining tergites smooth. Recurrent nervure received a little before the first transverse cubital nervure; cubitus sharply bent near the base.

Hab. Nyasaland, Mlanje (S. A. Neave), November to January.

This is very near *I. calopterus*, Szép. (Sjöstedt, Kilimandjaro-Meru Exp. ii. p. 33), and will probably prove to be a subspecies; but in that insect the fourth tergite is smooth and the sculpture of the third tergite confined to the middle. The two yellow bands of the fore wing are united in *calopterus*, but in some specimens of *permutans* the black area between the yellow bands is more or less broadly interrupted.

Iphiaulax grenadensis, Ashm.

Iphiaulax grenadensis, Ashm. Trans. Ent. Soc. London, p. 294 (1900).

♀ ♂.

Iphiaulax harperi, Cam. Trans. Amer. Ent. Soc. xxxi. p. 383 (1905).

♀.

Iphiaulax medianus, Cam. Journ. Roy. Agric. Soc. Demerara, i. p. 310 (1911) (nec Szép. 1901). ♀.

Iphiaulax villosus, Cam. Journ. Roy. Agric. Soc. Demerara, i. p. 310 (1911). ♂.

This has considerable economic importance as a parasite on the larva of the moth *Diatraea saccharalis*, the well-known sugar-cane pest.

The type-specimens of all the above-quoted names are in the British Museum.

Subfamily *EXOTHECINÆ*.*Spinaria aliciae*, sp. n.

♀. Rufo-ferruginea; abdomine pallide flavo; flagello, macula inter ocellos, segmentis dorsalibus primo secundoque in medio latissime, tertio quartoque omnino spinis lateralibus exceptis, unguiculis anticis, tarsis intermediis articulo apicali, tibiis tarsisque posticis nigris; coxis trochanteribusque posticis fusco-ferrugineis; femoribus posticis basi nigris, apice fusco-testaceis; alis fusco-hyalinis.

Long. 9 mm.

♀. Front shining, almost smooth; eyes very large, very distinctly emarginate near the base of the antennæ; posterior ocelli almost touching the eyes, situated very close to the hind margin of the head. Pronotum with a straight erect spine which does not reach the level of the mesonotum; parapsidal furrows well defined. Median segment rather indistinctly rugulose, with distinct lateral carinæ and a stout blunt spine on each side at the apical angles, the median third of the segment forming an area separated from the rest by a curved longitudinal carina on each side. Dorsal surface of the abdomen coarsely longitudinally striated; each segment with a low longitudinal carina in the middle, which is not produced into a spine on the third or fourth segments, both of which have a stout but rather short spine at the apical angles; fifth tergite very broad at the apex, produced into a long acute spine in the middle of the apical margin. Second abscissa of the radius not quite as long as the first transverse cubital nervure, but a little longer than the second.

Hab. North Queensland, Kuranda (Turner), July 1913.

Easily distinguished from *curvispina*, Cam., *luzonensis*, Enderl., and other Malayan species with somewhat similar colouring by the very large emarginate eyes and by the shorter and straight spine of the pronotum, also by the shorter second cubital cell. The second tergite is twice as broad as long.

Genus MESOBRACON, Szép.

Mesobracon, Szép. Termes. Füzetek, xxv. p. 46 (1902).

Telerda, Cam. Ann. S. Afric. Mus. v. p. 75 (1906).

Mesobracon maculiceps, Cam.

Telerda maculiceps, Cam. Ann. S. Afric. Mus. v. p. 75 (1906).

Mesobracon concolor, Szép. Ann. Mus. Nat. Hungar. iv. p. 579 (1906) (Dec. 25).

The localities in the British Museum range from Mombasa to Salisbury.

Subfamily DORYCTINÆ.

Genus TRICHIOBRACON, Cam.

Trichiobracon, Cam. Journ. Straits Br. Roy. Asiat. Soc. xliv. p. 104 (1905).

Trichodoryctes, Szép. Ann. Mus. Nat. Hungar. iv. p. 599 (1906).

Trichiobracon striolatus, Szép.

Acanthobracon striolatus, Szép. Termes. Füzetek. xxv. p. 48 (1902).

Trichiobracon pilosus, Cam. Journ. Straits Br. Roy. Asiat. Soc. xliv. p. 104 (1905).

Nestrimorus luteus, Cam. Ann. & Mag. Nat. Hist. (7) xvi. p. 161 (1905).

Subfamily CHELONINÆ.

Sphaeropyx conjugator, sp. n.

♀. Nigra; abdomine rufo-ferrugineo; mandibulis apice testaceis; femoribus anticis, tibiis anticis, tarsisque anticis basi extremo rufo-testaceis; alis dimidio basali hyalinis, dimidio apicali fuscis, venis nigris.

Long. 8 mm.

♀. Clypeus short and broad, shining and finely punctured; front finely punctured, with a longitudinal groove on each side nearly reaching the base of the antennæ; vertex smooth and shining, the head widely emarginate posteriorly, the ocellar region somewhat raised. Second joint of the flagellum very distinctly longer than the third, the first very short and almost concealed in the apex of the scape, length

of the antennæ 8 mm. Thorax smooth and shining, the scutellum finely punctured, the basal half of the scutellum occupied by a deep depression in which are three longitudinal carinæ, the apex and sides of the scutellum strongly longitudinally striated. Median segment smooth at the base, coarsely rugose-striate at the apex. Abdomen longitudinally rugose-striate, with only three visible tergites; second tergite with a distinct longitudinal carina; the first broader at the apex than long, not much narrowed to the base; the second a little shorter than the first, twice as broad at the apex as long; the third very little longer than the second, without teeth at the apex beneath. Recurrent nervure received before the first transverse cubital nervure.

Hab. S.W. Australia, Yallingup (*Turner*), November and December; three specimens.

The tergites are less strongly curved downwards both laterally and apically than in the European *S. irrorator*, from which it also differs in the absence of apical spines and in the broader and less elongate abdomen. It approaches the North-American *S. bicolor* much more closely in these points, but is a larger and more robust species. The colour of the fore femora and tarsi seems to vary, one specimen having the femora black and two having the tarsi except the apical joint testaceous red.

Sphæropyx neavei, sp. n.

♀. Nigra; palpis, mandibulis apice, abdomine, pedibus tegulisque rufo-testaceis; femoribus posticis apice, tibiis posticis apice, tarsisque posticis, basi extremo excepto, nigris; alis venisque fuscis.

Long. 7 mm.

♀. Front and clypeus closely punctured and sparsely clothed with fuscous pubescence; vertex and thorax shining, finely punctured; a broad transverse groove at the base of the scutellum divided by a longitudinal carina; median segment punctured-rugose, the sides rugose-striate. Abdomen rugose; the first segment with two longitudinal carinæ converging at the apex, a little longer than the apical breadth, half as broad again at the apex as at the base; second tergite a little longer than the first, not as long as the apical breadth; third tergite no longer than the second, without apical teeth. Recurrent nervure received before the first transverse cubital nervure.

Hab. N.E. Rhodesia, Serenje District, 4500 feet (*S. A. Neave*), December.

A smaller and less robust species than the last, but agreeing with it in the absence of apical abdominal spines.

Phanerotoma nova-guineensis, Szép.

Phanerotoma nova-guineensis, Szép. Termes. Füzetek, xxiii. p. 59 (1900). ♀.

A single specimen from Mackay, Queensland, taken in August 1900, answers well to the brief description of this species.

Phanerotoma leeuwinensis, sp. n.

♂. Brunneo-ochraceus; mesonoto lateribus, mesopleuris, segmento mediano, segmentisque dorsalibus lateribus nigris; segmento dorsali tertio fusco, pedibus pallide testaceis; tibiis posticis basi albidis apice pallide brunneis; alis hyalinis, venis fuscis.

Long. 2.5 mm.

♂. Antennæ 23-jointed, a little longer than the insect; the whole surface finely granulate, clothed on the head and thorax with very short and delicate white pubescence; sutures between the tergites finely crenulated, the third tergite distinctly longer than the second. Recurrent nervure interstitial with the first transverse cubital nervure; first abscissa of the radius as long as the second, but distinctly shorter than the second transverse cubital nervure. Median segment without a carina. Posterior ocelli a little further from the hind margin of the head than from each other.

Hab. S.W. Australia, Yallingup (Turner), November 1913.

Easily distinguished from *nova-guineensis* by the very different shape of the second cubital cell; in that species, as in most of the species of the genus, the second abscissa of the radius is much longer than the second transverse cubital nervure. The colour is probably variable as to the extent of the dark markings.

XXVII.—*The Genera of Hapalidæ (Marmozets).*

By R. I. Pocock, F.R.S.

Introduction.

MANY attempts have been made in the past to classify the marmozets generically, notably by Wagner, Lesson, Reichenbach, and Gray; but the distinctive characters employed have appealed so little to the judgment of modern zoologists

that of late years two genera only have been admitted—namely, *Hapale*, which has abnormal lower incisor teeth, and *Leontocebus* or *Midas*, in which these teeth are normal.

In 1912, however, Elliot ('A Review of the Primates,' i. pp. 179–233) grouped the species as follows:—

1. Genus *Seniocebus*, Gray, for *bicolor* (type), *martinsi*, *meticulosus*.
2. Genus *Cercopithecus*, Gronov., for *midas* (type), *ursulus*, *rufimanus*.
3. Genus *Leontocebus*, Wagn. (type, *chrysomelas*).
 Subgen. *a. Marikina*, Reich., for *chrysomelas*, *rosalia*, *leonina*.
 Subgen. *b. Tamarinus*, Trt., for *labiatus*, *mystax*, *devillei*, *illigeri*, *imperator*, *apiculatus*, *pileatus*, etc.
4. Genus *Ædipomidas*, Reich., for *ædipus* (type), *geoffroyi*.
5. Genus *Callithrix*, Erxl., for *jacchus*, *penicillata*, *argentata*, *leucopus*, *aurita*, *pygmæa*, and many others usually referred to the genus *Hapale*.

With a few modifications in the arrangement of the species and in nomenclature, this classification is a compromise between Gray's, published in 1870, and Trouessart's, published in 1899. In the matter of nomenclature, the chief points to notice are the use of *Cercopithecus*, Gronov., for *midas*, of *Callithrix* for *jacchus*, and the selection of *chrysomelas* as the type of *Leontocebus*. The characters used for differentiating the genera and subgenera are those supplied principally by the degree of hairiness of the face, head, and neck; but no characters are cited for distinguishing *Seniocebus* from *Ædipomidas** or *Cercopithecus* from *Leontocebus*. Hence it may be inferred that the genera, as defined, have no secure basis, and it cannot be admitted that the classification

* In spite of one's personal liking and respect for Dr. Elliot, it is necessary to explain as a warning to the unwary that he was quite unequal to the task of monographing the Primates, or of making even a presentable attempt at it. That he had no real acquaintance with the genera and species of the order is shown in the present instance by his describing the very well-known Pinché marmoset (*Ædipomidas ædipus*, Linn.) as a new species named *Seniocebuseticulosus*—that is to say, he diagnosed the same species under two different names and referred it to two distinct genera within a few pages of his monograph. Moreover, the figure of the skull he published to illustrate the dental characters of *Callithrix* (*Hapale*) contradicts the generic diagnosis—which, by the way, is itself wrong,—because the species *leucopus* is not a *Callithrix* at all, but, according to Elliot's system, should have been referred to *Seniocebus* or *Cercopithecus* or *Leontocebus*, I know not which.

is any improvement upon that of Gray, who in some particulars showed his usual instinctive, if unintelligent, anticipation of modern views in the matter of generic subdivisions. Tronessart's classification was a mere list of names.

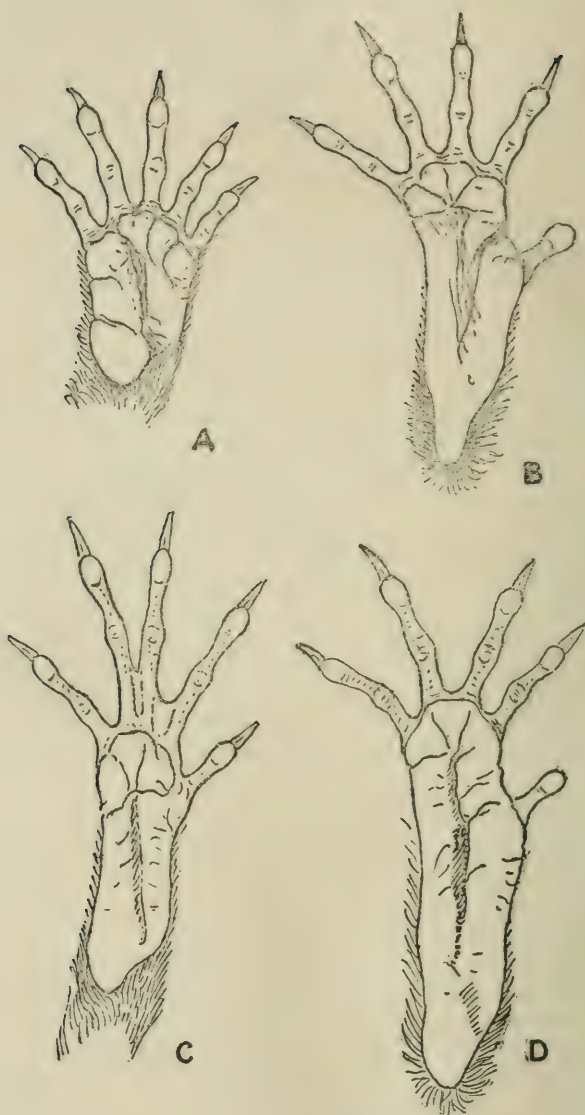
With regard to two of the generic names I adopt in this paper—namely, *Hapale* and *Mystace*—the following explanation must be given. By the rules of nomenclature the correct name for the group of marmozets typified by *jacchus* is *Callithrix*, as Thomas has shown. The latter title, however, has for many years been used for the "Titis" (*Callicebus*) of the family Cebidæ; and *jacchus* and its allies in all anatomical treatises and natural histories, popular and scientific, are universally assigned to *Hapale*. Similarly, if Gronovius be admitted as a binominalist—a question on which opinions are divided,—the oldest name for the genus typified by *midas*, Linn., is *Cercopithecus*, a title invariably associated with one of the African Catarrhine Primates until Elliot published his monograph. The confusion created by the adoption of *Callithrix* and *Cercopithecus* for two marmozets, involving, as it does, even familiar family-names, will be great and regrettable. They have therefore been added to the list of generic terms recommended for exemption from the strict rule of priority and for permission to stand for the genera to which for half a century or so they have been affixed. Pending the decision of the "Fiat Committee," which now has these cases under consideration, I have adopted *Hapale* instead of *Callithrix* and the next available name for the genus called *Cercopithecus* by Elliot, in the hope that the verdict of the Committee will endorse these decisions.

The Hands, Feet, and Ears of Marmozets.

Examination of fresh material of some of the commoner species of marmozets has revealed one or two external characters surpassing in systematic value those employed by Gray and Elliot for distinguishing genera.

The Hands and Feet.—In *Hapale jacchus* the five digits of the hand are tolerably evenly spaced, and are separated down to a point almost or quite on a level with the anterior border of the plantar pad, so that from the plantar aspect scarcely any webbing is visible. The pollex is tolerably long and is set low down a little behind the first digit, and reaches approximately to the distal end of its first phalanx when the digits are placed together. The palm of the hand is short and wide, its width across the plantar pads considerably exceeding half its length.

Fig. 1.



- A. Right hand of *Hapale jacchus*, nat. size.
B. Right foot of the same.
C. Right hand of *Leontocebus rosalia*, nat. size.
D. Right foot of the same.

In *Ædipomidas ædipus* the hand is to all intents and purposes like that of *Hapale jacchus*. But in *Leontocebus rosalia* it is very different. Both the digits and the palm are exceedingly long. The pollex is set higher up, so that, when closed against the second digit, its tip falls considerably short of the distal end of the first phalanx of the digit. The third and fourth digits are closely tied together by a very narrow web nearly up to the distal end of the first phalanx, and a similar but wider and shallower web ties the third to the second digit. The fourth and fifth, on the other hand, are separated as in *Callithrix* and *Ædipomidas*. The palm is very long behind the plantar pad, its width across that pad being less than one-third of its total length. Finally, the second digit is considerably longer than the fifth, the two being subequal in *Hapale jacchus* and *Ædipomidas ædipus*.

The feet in the three species are very much alike, though varying in length, the elongation affecting the area behind the point of insertion of the hallux. The digits are separated practically down to the plantar pad, so that from the plantar aspect a very shallow web shows beyond the anterior edge of the pad. The hallux, inserted well behind the second digit, reaches when stretched forward approximately the posterior border of the plantar pad. As regards the length of the foot, in *Hapale jacchus* the sole is about three times as long as its width across the plantar pad. In *Ædipomidas ædipus* and *Leontocebus rosalia* the corresponding comparative dimensions are respectively three and a half and four times. Thus, *Leontocebus rosalia* has a very long foot as compared with *Hapale jacchus*, and *Ædipomidas ædipus*, in that particular, holds a position midway between them*.

In connection with the feet, I am not able to point out any characters that can be used in the classification of marmozets. The hand, on the contrary, furnishes a good basis for the diagnosis of *L. rosalia*; and, since an examination of dried skins of this family in the British Museum and in the Zoological Society's Collection shows that *chrysomelas* is the only species with hands like those of *rosalia*, these two species may be placed in a genus apart from other marmozets.

The elongation of the feet in *L. rosalia* implies leaping powers surpassing those of *Hapale jacchus*, and it seems probable that the elongation of the palm and fingers of the hand and the tying together of the second, third, and fourth

* The foot of *Mystax midas* seems to resemble that of *Æ. ædipus* in length (Boas, Zool. Anz. xxxiv. p. 537, fig. 14, 1909).

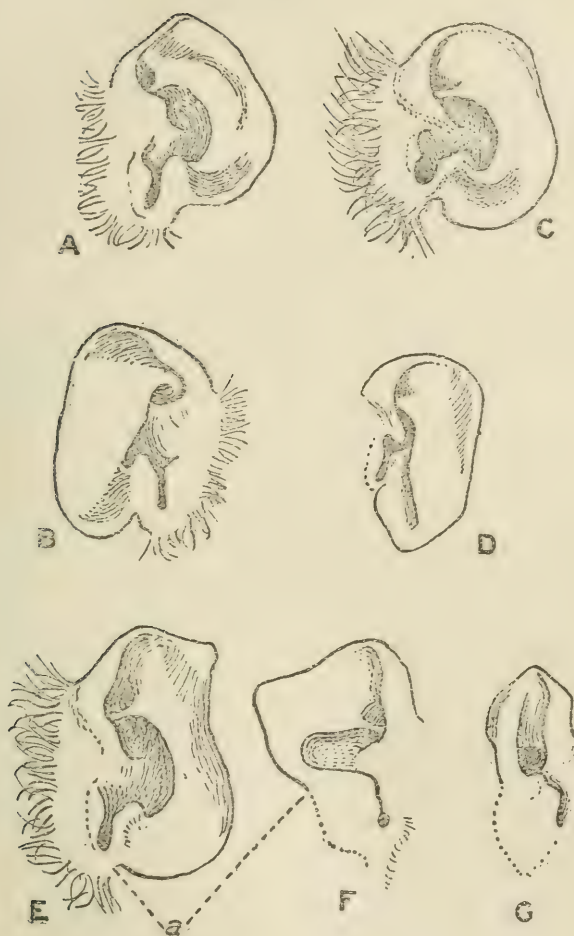
fingers are characters functionally correlated with the increased activity, and serve the purpose of giving at the same time a longer span and a safer grip on a branch when the animal alights from a long-distance spring.

It might be held that the small hallux and the claw-tipped digits of the Hapalidæ are primitive features derived direct from an unguiculate arboreal ancestor, probably of a lemuroid type, but preceding in those particulars modern lemurs, which have a hallux of great length and thickness and digits tipped with flat or flattish nails *. But, in my opinion, the Hapalidæ may be best regarded as derived from the typical Platyrrhine monkeys, from which they have departed in the numerical reduction of the teeth and in the appendicular particulars above-mentioned. The only Platyrrhine Primate outside the limits of the Hapalidæ which has the hallux small and the digits claw-tipped, as in the marmosets, is *Callimico*, Thos.; and it is to be remembered that both in *Callimico* and the Hapalidæ these characteristics of the hands and feet are associated with smallness in size and lightness in build. These little monkeys, indeed, are the most diminutive of all the true Primates, and, owing to the small size and narrow transverse span of the hands and feet, they are unable to grasp branches of any width. Nevertheless, since they are extraordinarily active and jump with great power, they require special means of maintaining a hold on the branches they traverse or alight on. In this need may be found, I think, the modification of the nails into claws and the concomitant reduction of the hallux which, while depriving the hands and feet of the peculiar prehensile capacity seen in other Primates, have converted them into extremities resembling functionally those of squirrels in their power of hooking on to the roughnesses of bark, of thick branches, and tree-trunks.

The Ears.—In *Hapale jacchus* the ears are large, with the upper edge, which is folded, either evenly rounded or sub-angular posteriorly, and the posterior border, which is unfolded, also evenly and widely rounded and forming inferiorly a continuously expanded lamina to a point just below the large fleshy valvular antitragus. The flap of the pinna extends widely beyond the central cavity of the ear both above, behind, and below, and its inferior portion just behind the antitragus shows a marked depression following the curve

* With the exception, of course, of the second digit of the foot, which in every genus carries a claw, and also of all the digits, apart from the hallux, of *Daubentonia* (*Chiromys*), in which the nails have been converted into claws.

Fig. 2.



- A. Left ear of *Hapale jacchus*, nat. size.
- B. Right ear of the same, partially folded, nat. size.
- C. Left ear of *Leontocebus rosalia*, nat. size.
- D. The same, partially folded.
- E. Left ear of *Mystar midas*, from life, enlarged.
- F. Right ear of *Edipomidas ædipus*, $\times \frac{2}{3}$ approx.
- G. The same, folded.

a, inferior point of origin of the free lamina.

of the inferior edge of the pinna. The notch between the antitragus and the small flap-like tragus is deep. The supratragus is a small ridge continuous posteriorly with the upper curved edge of the cavity of the pinna and overlapped in front by a flap of the pinna continuous with the overfolded supero-anterior edge. Below the supratragus this flap terminates near the middle of the anterior portion of the cavity of the pinna.

The ear is capable of being folded by the forward movement of its posterior half up against its anterior half, so that the central cavity is obliterated and the external auditory meatus closed by the antitragus coming into contact with the tragus.

I am unable to find any differences of importance between the ears of *Hapale jacchus* and those of *Leontocebus rosalia*, unless it be that in *Leontocebus* the depression on the lower portion of the lamina extends a little further forwards on to the antitragus. This character may be inconstant. The ears fold in the same way as in *Hapale*.

In *Ædipomidas adipus*, however, the ears are very different. They are relatively much smaller and quadrate in shape, both the upper and the posterior borders being markedly angled. The edge in front of the upper angle is folded; elsewhere the edge is simple. The flap-like area of the pinna above the central cavity is wide and deep, as in *Hapale*; but below the posterior angular point the flap rapidly narrows, and disappears entirely behind the antitragus, there being no broad laminate flap completing the pinna below and standing away from the cartilaginous basal portion of the ear. The antitragus forms a large fleshy valvular flap, but the tragus itself is very small. The ear folds as in the other species, the posterior angular point turning backwards. The only member of the Hapalidæ which resembles *Ædipomidas adipus* in the size and structure of the ear is its near ally *Æ. Geoffroyi*. In all the other species that I have examined the ear is of the type described in *Hapale* and *Leontocebus* in the sense that the free lamina of the pinna arises inferiorly beneath the antitragus and close behind the notch between the tragus and antitragus, and extends right round the cartilaginous capsule of the pinna, standing everywhere well away from the head.

Since, however, I have been dependent mostly upon dried skins, I cannot speak positively of the exact shape of the ears in all cases. Such species as *Mystax midas* and *M. mystax*, for example, appear to have the posterior edge of the ear

more strongly emarginate than *Hapale* and *Leontocebus*, the postero-superior angle being prominent and the postero-inferior lamina widely rounded. This I have been able to verify on a living example of *M. midas* *.

The chance of error in judging of the form of the ear from dried skins is shown by the skin of the type of *Micoella sericea*, Gray (= *Hapale chrysoleuca*, Wagn.), in the British Museum. This skin was made up for the study collection from a mounted specimen originally exhibited in the gallery, and the ears appear to be like those of *Ædipomidas*, except for the tufts of hair they carry. Nevertheless, from the original figure and description of the specimen (P. Z. S. 1868, p. 257, pl. xxiv.), it is evident that the pinna of the ear was provided in the living animal with a well-developed postero-inferior lamina apparently like that of *Hapale jacchus*. Clearly, therefore, the ears of the dried skin have been mutilated.

Synonymy of the Genera.

Genus LEONTOCEBUS, Wagner.

Leontocebus, Wagner, in Schreber's Säug. i. Uebersicht. p. ix (1839 or 1840) †; type *chrysomelas*, Kuhl. (selected by Elliot).

Leontopithecus, Lesson, Spec. Mamm. p. 200 (1840); type *marikina*, Less. = *rosalia*, Linn.

Marikina, Reichenbach, Vollst. Nat. Affen. p. 57 (1862); type *rosalia*, Linn.

In addition to *L. rosalia* and *L. chrysomelas*, which differ from all other Hapalidæ in their long-palmed, syndactylous hands, this genus probably contains *L. leoninus*, Humb., a species about which practically nothing is unknown apart from the colour.

* The importance of this observation lies in the error of determination that Boas ('Ohrknorpel etc. der Säugethiere,' 1912, pl. xxiii. fig. 243) seems to me to have made in figuring the ear of *Ædipomidas adipus* as that of *Hapale rufimanus* (= *Mystax midas*). At all events, this figure does not represent the ear of any example of *Mystax midas*, but corresponds closely with that of every specimen of *Ædipomidas adipus* that I have examined.

† Elliot, following Palmer, gives 1839 as the date of this name, presumably on Sherborn's authority (P. Z. S. 1891, p. 587); but, although the part of Wagner's edition of Schreber dealing with the monkeys was published, according to Sherborn, in 1839, it is not obvious that the "Uebersicht" and preface were published till 1840. The name may be given, however, the benefit of the doubt, thus carrying priority over *Leontopithecus*.

Genus *ÆDIPOMIDAS*, Reich.

Ædipus, Lesson, Spec. Mamm. p. 184 (1840) (nom. preocc.); type *titi*, Less. = *ædipus*, Linn.

Ædipomidas, Reichenbach, Vollst. Nat. Affen. p. 5 (1862); type *ædipus*.
Hapanelia, Gray, Cat. Primates, p. 65 (1870); type *geoffroyi*, Puch.

On the available evidence I provisionally regard this genus as a specialized offshoot of the bald-faced or so-called *Seniocebus* group of *Mystax*, differing therefrom in the modification and reduction in size of the ears—a character perhaps correlated with the nakedness of the adjoining area of the head.

To the two above-quoted species, everywhere admitted, Elliot added a third—*Æ. salaquiensis*, which is possibly at most only a subspecies of *Æ. geoffroyi* ('A Review of the Primates,' iii., Appendix, p. 255, 1912):

Genus *MYSTAX*, Gray.

Cercopithecus, Gronov. Zoophyl. p. 5 (1763); type *midas*, Linn. (selected by Elliot).

Midas, Geoffroy, Ann. Mus. Nat. Hist. Paris, xix. p. 120 (1812) (nom. preocc.); type *rufimanus* = *midas*.

Mystax, Gray, Cat. Monkeys etc., 1870, p. 66; type *mystax*, Spix.

Tamarin, Gray, op. cit. p. 68; type *ursulus*, Humb.

Seniocebus, Gray, op. cit. p. 68; type *bicolor*, Spix.

Tamarinus, Trouess. Cat. Mamm., Suppl. p. 29 (1899); type *mystax* (now selected).

Mystax may be regarded as a generalized type of Hapalidæ, with normal hands, ears, and dentition. *Leontocebus* has departed from it by the scansorial specialization of the hands, *Ædipomidas* by the degeneration of the ears, and *Hapale* by the specialization of the anterior teeth of the mandible.

Elliot gave full generic status to *Seniocebus*, which contains two species *—*bicolor*, Spix, and *martinsi*, Thomas,—basing the genus upon the nakedness of the forehead and cheeks as far back as the ears. But this character, merely a mark of maturity, clearly has not the systematic value of those employed in this paper for distinguishing *Leontocebus*, *Ædipomidas*, and *Hapale*. It is equivalent rather to the characters used by Gray, and derived from the hairiness of the aural area, for splitting up *Hapale* into several genera, which neither Elliot nor his immediate predecessors adopted.

Moreover, adult examples of *Mystax leucopus*, Güntr., a species which, as I have stated above, Elliot quite wrongly referred to the genus *Hapale*—or *Callithrix*, as he called it,—have the head covered with short hair back to the ears, and,

* As stated above, *S. meticulosus*, Elliot, is synonymous with *Ædipomidas ædipus*.

so far as I am aware, there is no evidence that this area becomes bald even in extreme old age. The condition presented by this species, indeed, lessens the value—small in any case—of the characters upon which *Seniocebus* was based; and if Elliot had not unconsciously evaded the difficulty by placing *leucopus* in a wrong genus, he would probably have been puzzled in deciding whether it should be located under *Seniocebus* or *Cercopithecus* or *Leontocebus*, in the sense in which he used those terms, because the species is intermediate between *Seniocebus* and the others, according to Elliot's definition of that genus.

Elliot quoted *Tamarin*, Gray, as a synonym of *Seniocebus*. This is an unintelligible error, because *Tamarin*, Gray, included only *midas* and *ursulus*, the two species to which Elliot restricted the name *Cercopithecus*. *Tamarin*, therefore, should have figured amongst the synonyms of *Cercopithecus*. Moreover, since *Tamarin* has line priority over *Seniocebus*, the former should have been adopted by Elliot, with *Seniocebus* as the synonym, if, as he stated, the two names had been applied to the same group of species.

Genus HAPALE, Illig.

Callithrix, Erxl. Syst. Règn. Anim. 1777, p. 55; type *jacchus*, Linn.*
Hapale, Illig. Prodr. Syst. Mamm. p. 71 (1811); type *jacchus*.

This genus contains many species broadly resembling *Myiastax* in the structure of the hands and feet, and apparently also of the ears, but differing from *Myiastax*, as from the other genera of the family, in the well-known modification of the anterior mandibular teeth described by Gray and others; the incisors are abnormally long, and form a continuous or nearly continuous series with the canines, which they approximately equal in height and thickness. This modification is accompanied by a more or less marked compression and recession of the chin. Although these characters are subject to a certain amount of specific and possibly individual variation, I have seen no skulls of *Hapale* which could not be at once identified as belonging to that genus.

* I see no reason to interfere with the synonymy of this genus as published by Elliot. I have only been able to examine in the fresh state one species—namely, *jacchus*, the common white-eared marmoset, with which the black-eared form, quoted as *penicillatus* and given full specific status by Elliot, completely intergrades. *Jacchus* may be taken as the type of *Sagoninus*, Kerr, *Hapale*, Illig., *Jacchus*, Geoffr., *Arctopithecus*, Virey, *Ouistitis*, Burnett, and *Liocephalus*, Wagn. Generic synonyms with other type-species are:—*Mico*, Lesson, type *argentatus*; *Micoella*, Gray, type *sericea* (= *chrysoleuca*); *Cebuella*, Gray, type *pygmaea*.

As has been stated, Gray split the genus *Hapale* into a number of genera, using the hair-growths or the ears and the adjoining parts of the head*. These characters are useful for grouping the species; but if generic value be assigned to them, a much higher value must consistently be granted to the characters by which the genera admitted in this paper are distinguished.

Table of the Genera.

- | | |
|---|----------------------------|
| <p>a. Hands with long narrow palm and long digits; digits 3 and 4 closely tied together by a narrow web reaching nearly to distal end of first phalanx; a similar but shallower and wider web between digits 2 and 3; [ears as under <i>b'</i>; incisors as under <i>a²</i>] ..</p> | <p><i>Leontocebus.</i></p> |
| <p>b. Hands with comparatively broad short palm and short digits separated approximately down to plantar pad.</p> | |
| <p>a'. Lamine margin of pinna complete above, but tapering away below and vanishing comparatively high up on the posterior surface of the basal cartilaginous capsule; [incisors as under <i>a²</i>].</p> | <p><i>Ædipomidas.</i></p> |
| <p>b'. Lamine margin of pinna widely continuous round the cartilaginous capsule, and terminating below the antitragus close to the head.</p> | |
| <p>a². Lower incisors normal, shorter and narrower than the canines, and separated from them; chin broad, receding to a comparatively slight extent</p> | <p><i>Mystax.</i></p> |
| <p>b². Lower incisors long, forming a subspatulate series with the canines, which at most exceed by a little the outer incisor in height and thickness; chin somewhat compressed and generally strongly receding</p> | <p><i>Hapale.</i></p> |

Note.—During the passage of this paper through the press, the opportunity has arisen of examining a specimen of *Mystax mystax* preserved in alcohol. Confirming what has already been stated of this species, I may add that the ears resemble those of *Mystax midas* and that the hands and feet are of the type seen in *Hapale* and *Ædipomidas*. It is interesting to note, however, that on the right hand, but not on the left, there is a deeper web between the third and fourth digits than I have as yet observed in the case of those genera. The web, nevertheless, is wider and shallower than in *Leontocebus*, although its presence adumbrates the syndactylism described in that form.

* By analogy the two species of *Cercocebus*—*albigenu* and *atterrimus*, the latter with obsolete, the former with long tufted whiskers—should be generically separated. Elliot, I may add, placed these two species in a subgenus *Lophocebus*; but one of the characters justifying this course was derived from an immature deformed (probably menagerie) skull.

XXVIII.—*A new Agouti from the Moon Mountains, Southern British Guiana, with Notes on other Species.* By OLD-FIELD THOMAS.

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THE agouti of the Moon Mountains, Southern British Guiana, seems to represent a new subspecies of *D. aguti*, L., a name under which I propose to place all the orange-rumped agoutis with the exception of the small insular *D. rubrata* of Trinidad.

The members of this group from the coast-region of North-eastern Venezuela and Northern Guiana are probably all referable to a single form, ranging from Cumana to Cayenne. The earliest name for them is *D. a. flavescens*, Thos., the later names *lucifer* and *cayennæ* being probably due to the great variation which our now considerable series from Demerara shows the animal to be liable to. Normal specimens from this area are dark-coloured, with blackish nape and darkened withers, the yellowish of the rump dark fulvous, and the under surface brown, with but little mesial lightening; the feet usually black. In individual specimens, however, all parts, and especially the rump, may be very much lighter.

In Brazil, on the other hand, the true *D. aguti* is always much lighter, the nape and withers without blackening, the under surface with a broad and distinct mesial line of white or yellow running its whole length from chest to inguinal region, the feet more or less grizzled with orange.

But from the Moon Mountains a series of specimens differ from both, and may be described as

Dasyprocta aguti lunaris, subsp. n.

Nape and fore back grizzled olivaceous grey, without any blackening. Rump ochraceous orange, generally darkened by inconspicuous blackish subterminal bands on the hairs—the colour fairly uniform in the series available. Flanks, sides of rump, and legs grizzled olivaceous, the orange not extending downwards on to them. Under surface scarcely lighter than sides, without median light stripe on chest, though there is generally an irregular whitish lightening on the belly and inguinal region. Hands brown, blackish, or grizzled. Feet grizzled olivaceous, only darkening to blackish terminally.

Dimensions of the type (measured on a well-made skin) :—
Head and body 510 mm.; hind foot 103; ear 40.

Skull : greatest length 110; condylo-incisive length 95; zygomatic breadth 49; nasals 37·5; interorbital breadth 29·5; palatal length 42; upper tooth-series (p^4 in use and worn) 18·2.

Hab. Moon Mountains, Southern British Guiana, about 1° N., 59° W. Other specimens, apparently referable to the same form, from the Lower Rio Yamunda and from the Upper Caura River, Orinoco.

Type. Adult female. B.M. no. 11. 6. 7. 43. Original number 9a. Presented by the late Mr. F. V. McConnell. Seven specimens.

This subspecies differs from true *D. aguti* by the absence of a mesial light stripe running down the chest and abdomen, from *croconota* by the non-extension of the orange rump-colour on to the sides of the hips and down the legs, and from the agouti of Northern British Guiana by its lighter general colour, and especially its lighter fore back, without blackening on nape and withers, and its less blackened feet. A baby specimen, however, has both the darkened fore back and blackish feet of the more northern form, which appears to indicate either variability or change with age. But, as Mr. McConnell's specimens were obtained by a native collector, and the localities were sometimes misstated, it is just possible that this young specimen was not from the Moon Mountains at all, but came from Demerara, where the same collector obtained a number of *D. a. flavescens*.

In a recent paper Dr. Allen* rather unaccountably (unless he has been solely influenced by the reputed locality "Guiana") considers that the Guianan yellow-rumped agoutis should bear the name of *D. croconota prymnolopha*, as based on Wagler's *D. prymnolopha*†; but the latter is at once distinguishable from all the *aguti* group by the black on the centre of the rump, and it was no doubt quite erroneously stated to be from Guiana, its true locality being Brazil—from Para to Bahia.

In this connection I may note that three agoutis from Lamarao, Bahia, collected by A. Robert, clearly represent Osgood's *D. nigriclunis*‡; but they differ so widely among

* Bull. Ann. Mus. xxxiv. p. 629 (1915).

† 'Isis,' 1831, p. 619.

‡ Field Mus. Publ. x. p. 192 (1915).

themselves in the degree to which the yellow of the sides of the rump is grizzled or clear, that, with this character shown to be variable, I very much doubt if *nygriclunis* should be considered as distinct from *prymnolopha*, to which these specimens have hitherto been referred.

Dr. Allen * has also recently tried to show that *Myoprocta pratti*, Pocock, is synonymous with *Dasyprocta exilis*, Wagl., from the Amazon, which has usually been synonymized with *M. acouchy*.

But how he can deduce that "*D. exilis* belongs evidently to the olivaceous and not to the rufous section of the genus" from Wagler's words "*notæo toto castaneo-fuscescente*" I am at a loss to understand. And the rest of Wagler's description equally applies to *M. acouchy*, with the quite unimportant exception of the median white stripe on the belly.

The British Museum contains a *Myoprocta* from Obidos which is no doubt representative of *D. exilis*, and this is in all respects similar to typical *M. acouchy* of Guiana.

The relation of Allen's *M. milleri*, from Colombiã, to Pocock's Amazonian *M. pratti* still remains to be settled.

XXIX.—A new Mink-like *Mustela* from Java.

By H. C. ROBINSON and OLDFIELD THOMAS.

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THE animal here described was obtained during 1916 in Java by Robinson, and forms a very striking addition to the fauna of that island. It is widely different from any known Oriental *Mustela*, but has a very remarkable resemblance to a mink, especially to the European one (*Mustela lutreola*), on which fact we have based its name.

Mustela lutreolina, sp. n.

Type.—Adult male (skin and skull). Formerly Federated Malay States Museums, no. 190/16; now British Museum, no. 17. 8. 4. 2. Collected at Tjibodas, West Java, 5500', on February 17th, 1916, by H. C. Robinson. Original number 7231.

Characters.—A large-sized species of the subgenus *Mustela*,

* *Op. cit.* xxxv. p. 569.

of almost uniform otter-brown coloration above and below. Soles very hairy. Fur short, hairs of back about 6 mm. in length, the longer hairs quite glossy, as in the mink.

Colour.—Above almost uniform brown (darker than "Mars-brown" of Ridgway), sparsely interspersed with white hairs, which may be accidental; tail with a somewhat golden tinge, and a faint indication of a dark tip; conch of ears with golden hairs. Beneath somewhat lighter, nearest to "Prout's brown" of Ridgway; lips, chin, and interramia white.

Skull.—That of a typical weasel, the profile of the rostrum somewhat convex, not specially flattened; the bullæ large, flattened, quadrate, not triangular in outline, their inner margins nearly parallel. Mastoid ridges prominent. Interpterygoid space truncate, not rounded at the anterior extremity. Teeth with no special peculiarities. Posterior upper molar dumbbell-shaped.

Dimensions.—Head and body (dry skin) 360 mm.; tail 180; hind foot 50.

Skull: total length 58·5; basal length 53·8; condylo-basilar length 58; palatal length 26; rostral breadth (behind canine) 12·3; interorbital breadth 11·8; zygomatic breadth 30; mastoid breadth 26·5; maxillary tooth-row (including canine) 16·5; mandible from symphysis to most posterior point of condyle 32·8.

Specimens examined.—One, the type.

Remarks.—This specimen was shot by a Dyak collector while it was engaged in killing a *Lariscus insignis javana*. In colour it presents an extraordinary resemblance to a young otter, and on this account was unfortunately not measured in the flesh. The species would appear to be allied to *M. subhemachalana*, Hodgs., known from Sikkim and Nepal at high elevations, and also recorded from near Bhamo and the Karin Hills*, but differs by its much darker colour, in which respect it is so like a European mink (*Mustela lutreola*) as only to differ by the golden tinge of the hairs of the ears and tail. The fur is not so long as in that animal, nor the tail so bushy, as is only natural in a tropical climate; but otherwise, apart from the skull, there is very little to distinguish the two.

* Thomas, Ann. Mus. Civ. Gen. xli. p. 919 (1892).

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 6th, 1917.—Dr. Alfred Harker, F.R.S., President,
in the Chair.

The following communication was read:—

‘Correlation of Jurassic Chronology.’ By S. S. Buckman, F.G.S.

This paper owes its inception to certain discoveries made by the Officers of the Scottish Geological Survey during their investigations of the Jurassic deposits of the Isles of Raasay and Skye. The ammonites and brachiopods were sent to the Author for examination, and the sequence of faunas which they disclosed necessarily led to comparison with results obtained in other areas—with Yorkshire, on which the Author had recently written a paleontological chapter for a Geological Survey Memoir, based largely on information and specimens submitted by the Survey; with the Dorset coast, helped by Mr. W. D. Lang’s most painstaking work: with other areas within the Author’s field experience, helped largely by information most freely communicated by Mr. J. W. Tutchet. The results appeared to be so far-reaching, that permission was asked of the Director of H.M. Geological Survey to lay before the Society a synopsis of the information obtained through the investigations of Survey Officers: this was kindly accorded, and the present paper is the outcome of research thus originated.

One of the principles utilized in this paper to ascertain or to surmise faunal sequence where precise information is defective, is that of what may be called ‘faunal dissimilarity’—that is, if the deposits of two neighbouring localities A and B, supposedly isochronous from their sequential position, show differing faunas, it is a reasonable inference that the faunas are not of the same date. Theoretical stratigraphical correlation has usually worked along these lines, but the principle involved has not been recognized by name. Now the principle is utilized, not only in regard to neighbouring localities, but even more widely, with suggestive results.

The paper is chiefly concerned with the Liassic Ages hitherto known as Domerian, Charmouthian, Sinemurian. In all of them there is proposed a considerable increase of the number of faunal horizons indicative of consecutive time-intervals, or hemeræ. In the case of the first no change of name is made; but in regard to the other two, subdivision seemed necessary, and each is apportioned into three Ages, as follows:—

<i>Proposed Names.</i>	<i>Old Terms.</i>
Hiviceian. }	Charmouthian.
Wessexian. }	
Raasayan. }	
Deiran. }	Sinemurian.
Mercian. }	
Lymian. }	

These, with the Domerian, each contain on an average about ten hemere, the grouping being controlled by the dominance of ammonite families or phases thereof—thus, Domerian: Age of Amaltheids; Raaayan: Age of Deroceratide and Echioceratide. It is obvious that, with this increase in the number of hemere, the number of local non-sequences is greatly increased. Some comparative diagrams illustrate this.

One of the most interesting discoveries which has resulted, partly from the great thickness of Scottish strata investigated and collected from, partly from comparisons with other areas, is that the so-called '*armatum* Zone' of the English Midlands and that of the Radstock district, of Yorkshire and of the Scottish Isles, are not isochronous, but are separated by a time-interval which corresponds to a thickness of some 300 feet of deposit in the Scottish area. Thus, instead of the simple descending sequence

Deroceras armatum
Echioceras raricostatum,

there is this sequence ascertained:

An upper *Deroceras* horizon,
 An upper *Echioceras* horizon in three distinct stages,
 A lower *Deroceras* horizon,
 A lower *Echioceras* horizon with some *Armatoids*;

and even now possibly this is not the end of the complication. This alternation of *Deroceras* and *Echioceras* involves a phenomenon which the Author calls 'faunal repetition,' and it is a reasonable supposition that this is not a solitary case—that is to say, doubt is at once thrown on the contemporaneity of other so-called 'zones' where they have been determined in different areas by the presence of certain species of a genus—the species admittedly not the same—or by the alleged presence of a single species on specific determination insufficiently rigid. The cases of zones determined on the *lucus a non lucendo* principle—the strata in correct intermediate position, but with the index zonal species conspicuously absent—seem especially to invite scepticism.

Three appendices are given—one, palæontological, containing descriptions of certain notable species, mostly new; another, historical, containing notes on certain ammonites described and figured by Wright in a paper published some years prior to the issue of his Monograph: it affords clues to the interpretation of his species, to the recognition of some of his missing types, to the identity of certain figures in Reynès's Monograph, and to the geographical distribution of species—a matter of particular importance in regard to faunal dissimilarity; the third, geological,—a communication by Mr. J. W. Tutcher, embodying his reading of the sequence in the lower part of the Lower Lias carried down to the base of the Hettangian.

THE ANNALS

AND

MAGAZINE OF NATURAL HISTORY.

[EIGHTH SERIES.]

No. 118. OCTOBER 1917.

XXX.—*Descriptions of New Pyralidæ of the Subfamilies Hydrocampinæ, Scopariinæ, &c.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

[Concluded from p. 216.]

(1 s) *Stenia fusalis*, sp. n.

Head, thorax, and abdomen white, the tegulæ cupreous brown in front, the shoulders black-brown, the rest of thorax with a slight cupreous tinge; antennæ ringed with dark brown; frons black-brown at sides; palpi black-brown, white at base and in front; pectus, legs, and ventral surface of abdomen white, the legs slightly tinged with cupreous, the fore tibiæ black in front. Fore wing pale red-brown with a cupreous gloss and thickly irrorated with dark brown, the costa darker towards base; an indistinct brown antemedial line, excurved to submedian fold and incurved at vein 1; a small white spot in middle of cell and a white discoidal bar; postmedial line indistinct, dark, excurved from discal fold to vein 2, then retracted to the cell, then oblique and excurved in submedian interspace; a terminal series of black points; cilia with a dark line near base. Hind wing white, the terminal area tinged with cupreous red-brown except towards tornus; a blackish discoidal point; postmedial line indistinct, dark, sinuous, bent outwards between veins 5 and 2, then retracted and excurved to inner margin; a terminal series of black bars; cilia tinged with red-brown at base and with dark line at middle to vein 2.

Ab. 1. Fore wing with the lines distinct.

Ab. 2. Fore wing whiter, slightly tinged with red-brown.

Hab. COLOMBIA, Sierra del Libane (*H. H. Smith*), 3 ♂, 8 ♀ type. *Exp.* 26–28 mm.

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(1 a, b) *Stenia glaucinalis*, sp. n.

♀. Head, thorax, and abdomen glossy grey-brown; palpi black-brown, white in front to extremity of 2nd joint; legs dark brown, the tarsi white; ventral surface of abdomen white. Fore wing glossy grey-brown; a white discoidal bar; cilia white at tips. Hind wing pale glossy grey-brown, the cilia white at tips.

Hab. BOLIVIA, Yungas de la Paz (*Seebold*), 1 ♀ type. *Exp.* 22 mm.

(3 d) *Piletocera scotochroa*, sp. n.

♂. Head, thorax, and abdomen dark red-brown, the anal tuft white tinged with red-brown; antennæ with the tufts of hair whitish at extremities; palpi, pectus, and legs black-brown; ventral surface of abdomen grey-brown. Fore wing dark glossy red-brown; an indistinct whitish antemedial striga below costa and striga in cell rather further from base with a black-brown spot beyond it; postmedial line indistinct, dark, defined on outer side by whitish, faintly except towards costa, slightly waved, retracted at vein 2. Hind wing dark glossy red-brown; postmedial line brownish white, erect and slightly waved to vein 2 near termen, then retracted to lower angle of cell and erect to tornus.

Hab. SOLOMON Is., Gizo I. (*Meek*), 1 ♂ type. *Exp.* 24 mm.

(3 e) *Piletocera albiventralis*, sp. n.

♂. Head, thorax, and abdomen very dark glossy brown; antennæ white from the contortion to tips; ventral surface of abdomen white. Fore wing uniform very dark brown with a cupreous gloss. Hind wing very dark brown with a cupreous gloss, the costal area greyish.

Hab. SOLOMON Is., Choiseul I. (*Meek*), 2 ♂ type. *Exp.* 24 mm.

(3 f) *Piletocera purpureofusa*, sp. n.

♂. Head, thorax, and abdomen very dark glossy brown, the anal tuft with white mixed; antennæ whitish from the contortion to tips; ventral surface of abdomen white. Fore wing uniform very dark brown glossed with purple. Hind wing very dark brown with a purple gloss, the costal area greyish.

Hab. SOLOMON Is., Choiseul I. (*Meek*), 2 ♂ type. *Exp.* 22-24 mm.

(12 a) *Piletocera plumbicostalis*, sp. n.

Fore wing of male with veins 8, 9, 10 not bent upwards towards costa.

♂. Head and thorax dark brown with a cupreous gloss, the head and tegulae with some white, the abdomen with white segmental

line on 4th segment; antennæ whitish tinged with cupreous brown; palpi white at base and in front; pectus, legs, and ventral surface of abdomen white suffused with cupreous brown, the tarsi nearly pure white. Fore wing dark brown with a cupreous gloss, the costal area with a leaden blue gloss; a small ochreous white spot in end of cell; a subterminal white bar from costa and a white mark on termen at submedian fold; cilia white above tornus. Hind wing dark brown with a cupreous gloss; a slight white mark in middle of cell and indistinct ochreous whitish antemedial line from submedian fold to inner margin; an indistinct ochreous whitish spot beyond lower angle of cell and line from submedian fold to inner margin; cilia grey-brown with a dark line near base to vein 2, then white with some dark brown at base towards tornus.

Hab. DUTCH N. GUINEA, Wataikwa R. (*Wollaston*), 1 ♂ type. *Exp.* 16 mm.

(13 a) *Piletocera ruficeps*, sp. n.

♂. Head and tegulæ white suffused with rufous; thorax and abdomen dark brown with a slight blue gloss, the genital tufts white faintly tinged with rufous; antennæ dark cupreous brown; palpi rufous, the 3rd joint dark brown; pectus, legs, and ventral surface of abdomen white tinged with rufous, the fore tibiæ and tarsi dark brown in front. Fore wing dark brown with a cupreous gloss, the basal and costal areas with a slight blue gloss; an ochreous white spot below middle of costa and a slight mark at lower angle of cell; a small triangular ochreous white subterminal patch on costa; a slight white mark on termen at submedian fold; cilia white towards tornus with a dark line near base. Hind wing dark brown with a slight cupreous gloss; cilia white from vein 2 to near tornus with a dark line near base.

Hab. BR. N. GUINEA, Kumusi R. (*Meek*), 1 ♂ type. *Exp.* 22 mm.

(13 b) *Piletocera violascens*, sp. n.

♂. Head and tegulæ white mixed with dark brown; thorax and abdomen dark brown glossed with grey, the latter with white band on 2nd segment, the genital tuft white faintly tinged with red-brown; antennæ white from the contortion to near tips; palpi white on outer side at base; pectus, legs, and ventral surface of abdomen white, the fore legs suffused with brown. Fore wing dark brown tinged with purple; an indistinct whitish antemedial line from below costa to inner margin; a white bar in the cell near extremity and slight whitish discoidal striga; a white subterminal bar from costa; cilia white at submedian fold. Hind wing dark glossy brown; some whitish at base; a diffused whitish antemedial band from below costa to inner margin followed by a rather diffused dark line; cilia white at tips, wholly white from vein 2 to near tornus.

Hab. DUTCH N. GUINEA, Kapaur (*Doherty*), 1 ♂ type; D'ENTRECASTEAUX Is., Fergusson I. (*Meek*), 1 ♂. *Exp.* 20-24 mm.

(13c) *Piletocera albimixtalis*, sp. n.

♂. Head, thorax, and abdomen cupreous brown mixed with dark brown and some white, the abdomen with white band on 2nd segment, the genital tufts white; antennae whitish tinged with brown, the contortion and tuft of hair dark brown; palpi with the basal half white faintly tinged with rufous, the terminal half brown; pectus, legs, and ventral surface of abdomen white tinged with rufous, the fore tibiae with a blackish patch before extremities which are white and the hair on tarsi blackish toward base. Fore wing cupreous brown mixed with whitish; a faint oblique whitish antemedial line with a slight white spot beyond it in the cell; a quadrate white spot in end of cell extending to just below the costa, and a dark discoidal patch with a whitish striga on it; postmedial line whitish defined on inner side by diffused dark brown, forming a small triangular white mark at costa, then sinuous to vein 2, where it forms a slight white patch before termen, then retracted to lower angle of cell and excurved to inner margin; cilia white from vein 2 to above tornus. Hind wing white slightly tinged with brown, the terminal area dark cupreous brown, broadly at costa, narrowing to tornus; an oblique cupreous brown discoidal bar, its lower extremity touching the sinuous cupreous brown postmedial line; an oblique white patch from vein 4 to termen at vein 2; cilia with slight whitish line at base and some white at tips, wholly white in submedian interspace.

Hab. QUEENSLAND, Cooktown, Cedar Bay (*Meek*), 1 ♂ type. *Exp.* 22 mm.

(16c) *Piletocera stenipteralis*, sp. n.

♂. Head, thorax, and abdomen dark cupreous red-brown, the metathorax white, the two basal segments of abdomen with white segmental lines, the genital tufts creamy white; pectus and ventral surface of abdomen white suffused with cupreous red-brown. Fore wing long and narrow, dark cupreous red-brown; an indistinct sinuous whitish antemedial line from below costa to inner margin; a small triangular whitish mark in end of cell; a dark discoidal lunule with a curved whitish striga on it; postmedial line whitish defined on inner side by diffused dark cupreous brown, excurved below costa and between veins 4 and 2, then retracted to below end of cell and erect to inner margin; the terminal area tinged with grey and with a terminal series of minute black-brown spots; cilia whitish at submedian fold. Hind wing dark cupreous red-brown with obscure dark terminal line; the cilia greyish at tips.

Hab. BR. N. GUINEA, Mambar R., Biagi (*Meek*), 4 ♂ type. *Exp.* 22-24 mm.

(16 d) *Piletocera leucocephalis*, sp. n.

♂. Head and tegulæ silvery white, the sides of frons and shoulders dark brown; thorax glossy brown with some white at base of patagia and sides of metathorax; abdomen white banded with brown at base, then glossy brown with the genital tufts white tinged with rufous; antennæ dark brown, white from the contortion to near tips; palpi brown, white tinged with brown at base and in front to near extremity of 2nd joint; pectus and ventral surface of abdomen white tinged with brown; legs brown. Fore wing cupreous red-brown; a slight whitish antemedial spot in the cell and line from cell to inner margin; a quadrate white patch in end of cell and dark discoidal lunule with curved whitish striga on it; a wedge-shaped white subterminal mark from costa to discal fold; a slight white mark on termen at submedian fold. Hind wing with the basal half white, the terminal half dark cupreous brown; a round cupreous brown discoidal spot; a rather diffused cupreous brown postmedial line from discal fold to inner margin, confluent with the lower terminal area to vein 2; cilia white with a brown line near base in submedial interspace.

♀. Head and tegulæ suffused with brown; antennæ wholly brown; abdomen with some whitish at base.

Hab. BISMARCK ARCH., Rook I. (*Meek*), 3 ♂, 2 ♀ type. *Exp.*, ♂ 26, ♀ 22 mm.

(20 a) *Piletocera maculifrons*, sp. n.

♂. Head white with dark brown spot on frons and the vertex tinged with brown; thorax and abdomen dark reddish brown, the latter with some whitish at base and a spot on anal segment; palpi dark brown, the basal joint, 2nd joint in front at base, and the 3rd joint white; pectus, legs, and ventral surface of abdomen pure white, the fore tibiae with black patch at extremity, and the tarsi ringed with blackish. Fore wing dark reddish brown; a small ochreous white antemedial spot below the costa and slight whitish line from cell to inner margin; an ochreous white patch in end of cell and points beyond the angles of cell; the terminal half of costa with four small ochreous white patches with black-brown between them; a slight ochreous white mark before termen at submedian fold; cilia creamy white with a dark line near base, the tips dark brown at middle and at tornus. Hind wing dark reddish brown, the costa white towards base; a small ochreous white spot before termen at submedian fold; cilia white with a dark brown line near base, the tips brown towards apex, at middle, and at tornus.

Hab. ASSAM, Khâsis, 1 ♂ type. *Exp.* 14 mm.

(20 b) *Piletocera leucogastralis*, sp. n.

♂. Head white mixed with dark brown; thorax and abdomen dark brown, the latter with diffused whitish band on 2nd segment

and a leaden gloss towards extremity; antennæ brown, the contortion and tuft darker; palpi whitish at base; pectus, legs, and ventral surface of abdomen pure white, the fore tibiæ and tarsi brown above ringed with white. Fore wing glossy grey-brown, the basal half with some white mixed; an indistinct whitish antemedial line from below costa to inner margin; a white bar in the cell near extremity and white discoidal striga; a small triangular white subterminal mark from costa; cilia with a fine whitish line at base, the tips whitish in submedian interspace. Hind wing with the basal area white mixed with some brown, defined by a rather diffused dark antemedial line somewhat excurved at the discocellulars, and defined on outer side by white below the cell; cilia with a fine whitish line at base and the tips whitish in submedian interspace.

Hab. DUTCH N. GUINEA, Kapaur (*Doherty*), 1 ♂ type. *Exp.* 18 mm.

(21 a) *Piletocera bisignalis*, sp. n.

♀. Head whitish tinged with brown; thorax cupreous brown; abdomen with the base whitish tinged with cupreous brown, the terminal part grey-brown with darker segmental lines; palpi white at base; pectus, legs, and ventral surface of abdomen white slightly tinged with red-brown, the fore tibiæ with dark band at extremity. Fore wing whitish suffused with cupreous brown to beyond the cell, the terminal area cupreous brown; a diffused darker brown antemedial line; a round dark brown spot in middle of cell and elliptical discoidal spot with curved white striga on it; a white subterminal line defined on inner side by diffused dark brown, incurved below vein 6. Hind wing with the basal area white tinged with brown and with some dark brown at base below the cell; a diffused dark brown antemedial line from discal fold to inner margin; an indistinct dark postmedial line, excurved beyond lower angle of cell; cilia with slight whitish line at base, the tips whitish in submedian interspace.

Hab. BALI (*Doherty*), 1 ♀ type. *Exp.* 18 mm.

(23 a) *Piletocera discisignalis*, sp. n.

♂. Head white mixed with some red-brown; thorax and abdomen dark red-brown, the genital tufts white faintly tinged with red-brown; antennæ whitish tinged with red-brown to the contortion and tuft which are dark brown, the apical part red-brown; palpi red-brown; pectus, legs, and ventral surface of abdomen white, the fore tibiæ with dark band near extremity, the tarsi brown ringed with white. Fore wing glossy reddish brown; an indistinct dark antemedial line faintly defined on inner side by whitish, rather oblique to submedian fold, then incurved; a white bar in the cell near extremity and dark discoidal patch with minute white spot at lower angle of cell; subterminal line white and

strong to vein 6, then faint and whitish, defined on inner side by rather diffused dark brown, incurved between veins 6 and 3; cilia with fine white line at base. Hind wing whitish suffused with glossy reddish brown; a slight dark shade near base; a diffused dark antemedial line from discal fold to inner margin; postmedial line indistinct, diffused whitish defined on inner side by diffused dark brown, excurved beyond lower angle of cell; cilia with fine whitish line at base, the tips whitish at submedian fold.

Hab. ASSAM, Khâsis (*Nissary*), 1 ♂ type. *Exp.* 20 mm.

(23 b) *Piletocera bistrigalis*, sp. n.

♀. Head pale grey-brown; thorax and abdomen glossy dark grey-brown; palpi red-brown, whitish on basal half; pectus and ventral surface of abdomen white; legs pale red-brown. Fore wing dark reddish brown; a strong white antemedial line, arising below the costa and oblique to vein 1; an excurved white bar at middle of cell and stronger discoidal bar; postmedial line whitish, forming a wedge-shaped white mark from costa, excurved between veins 5 and 2, then incurved; cilia whitish with a brown line near base in submedian interspace. Hind wing dark reddish brown; some whitish at base; an indistinct diffused whitish medial line from discal fold to inner margin; a faint whitish postmedial line, excurved below discal fold and ending at vein 2; cilia white at tips at submedian interspace.

Hab. DUTCH N. GUINEA, Mimika R. (*Wollaston*), 1 ♀ type. *Exp.* 16 mm.

(32 c) *Piletocera aurantialis*, sp. n.

Head and base of tegulæ orange, the rest of thorax black; abdomen orange with the three terminal segments black; antennæ black from one fourth to middle; pectus blackish; legs and ventral surface of abdomen orange, the fore tibiæ with black band near extremity, the anal tuft black except at middle of base. Fore wing orange; the costal area black, extending to inner margin at base, into the cell at middle, and as a triangular patch to lower angle of cell; the terminal area black, its outer edge excurved and slightly waved to vein 3; an antemedial black striga from the costal area to submedian fold; postmedial line black, slightly sinuous from the costal area to vein 3, then retracted to near lower angle of cell, then oblique to submedian fold, where it terminates; a fine pale line at base of cilia. Hind wing orange, the terminal area black, its inner edge excurved and slightly waved to vein 2; a small black spot in end of cell and striga from submedian fold to vein 1; a slight oblique sinuous black postmedial line from vein 6 to the terminal area at submedian fold; a fine pale line at base of cilia.

Hab. MOLUCCAS, Batchian (*Doherty*), 2 ♂, 2 ♀ type. *Exp.* 20 mm.

(33a) *Piletocera flavidiscalis*, sp. n.

♂. Head, thorax, and abdomen dark brown mixed with ochreous yellow, the last with the extremity ochreous yellow; palpi brown, white at base; pectus, legs, and ventral surface of abdomen white, the fore legs with some brown in front. Fore wing dark brown mixed with some ochreous yellow, the costa with alternating ochreous yellow and black spots except towards base; slight pale ochreous antemedial marks in the cell and above inner margin; a quadrate ochreous white patch in end of cell and ochreous yellow discoidal striga; a faint dark postmedial line, slightly waved to vein 2, then retracted to below end of cell and erect to inner margin; an oblique ochreous yellow patch from vein 3 to termen at vein 2; a fine ochreous yellow line at base of cilia which are wholly ochreous below apex and in submedian interspace. Hind wing dark brown; a diffused ochreous yellow antemedial band, separated by an oblique dark discoidal bar from an oblique conical ochreous yellow postmedial patch from costa to vein 2, which is defined on outer side by the dark postmedial line which is retracted at vein 2 to the discoidal bar, then defining the antemedial band; an oblique ochreous yellow patch from vein 3 to termen at submedian fold; cilia brown and whitish to vein 2 with a fine white line at base, followed by a dark line, then ochreous yellow with some brown at tornus.

Hab. SIKKIM (Möller), 1 ♂ type. *Exp.* 18 mm.

(33c) *Piletocera metochrealis*, sp. n.

Head and thorax reddish brown mixed with dark brown and some whitish; abdomen creamy white at base, then black with white segmental lines, the anal tuft pale rufous irrorated with dark brown; antennæ ringed black and white; palpi dark brown, white at base; pectus, legs, and ventral surface of abdomen white, the fore and mid femoro-tibial joints and the fore tibiae at extremities black. Fore wing ochreous tinged with red-brown and thickly irrorated with black-brown; antemedial line black, oblique, waved; a small pale spot in middle of cell and discoidal bar, both defined by black; postmedial line black, forming a slight spot at costa, then slightly waved, at vein 2 retracted to lower angle of cell; a terminal series of small black spots to vein 4 and a small spot at vein 2; cilia ochreous white with a dark line near base and faint brown line near tips to vein 2. Hind wing pale ochreous with a dark brown apical patch; a black discoidal bar; postmedial line blackish, slightly waved to termen at submedian fold, then obsolescent and retracted to below angle of cell, and with blackish bar at inner margin; a terminal black line from apex to vein 4; cilia with a dark line near base to vein 3.

Hab. CEYLON, Maskeliya (Pole), 1 ♂, Pattipola (Green), 1 ♂, Namunakuli (Green), 2 ♂, 1 ♀ type. *Exp.* 18 mm.

(37 h) *Piletocera costifascialis*, sp. n.

♂. Head and thorax pale reddish brown, the metathorax with some ochreous white; abdomen ochreous white tinged with brown, the genital tufts rufous; antennæ brownish white, ringed with black towards base; palpi whitish, tinged with red-brown except at base; pectus, legs, and ventral surface of abdomen ochreous white. Fore wing pale ochreous, the costal area brown with alternating small dark and ochreous spots on costa; an indistinct dark antemedial line from costa to vein 1; a pale discoidal bar defined on each side by black bars; postmedial line brown, incurved at discal fold, excurved between veins 5 and 2, then retracted to below angle of cell and excurved above inner margin; the terminal area brown to vein 4 and with brown patch at tornus, the termen with blackish points to vein 4; cilia ochreous white. Hind wing pale ochreous, the terminal area dark brown from apex to vein 3; a small blackish discoidal spot; postmedial line blackish, incurved at discal fold, excurved between veins 5 and 2, then obsolete and retracted to below end of cell, then dark to inner margin; the termen ochreous white towards apex, with two minute blackish spots below apex; a dark patch at tornus; cilia ochreous white.

Hab. SELANGORE, Kuala Lumpur (*Durham*), 1 ♂ type. *Exp.* 16 mm.

(38 e) *Piletocera mesophæalis*, sp. n.

♀. Head, thorax, and abdomen red-brown mixed with some ochreous whitish; antennæ red-brown, the basal joint whitish. Fore wing whitish suffused with red-brown, the medial area dark red-brown with a purplish gloss, the terminal area cupreous red-brown; a diffused red-brown subbasal band, oblique to median nervure and followed by a whitish antemedial band except at costa; a white patch in end of cell with a lunulate dark spot on it; a white postmedial band, obliquely curved to vein 3, then retracted to below end of cell and erect to inner margin; cilia brown with a whitish line at base. Hind wing cupreous brown with the base white; traces of a pale curved postmedial line; cilia brown with a fine whitish line at base to vein 3, then whitish with a faint brown line near base.

Hab. DUTCH N. GUINEA, Mt. Goliath (*Meek*), 1 ♀ type. *Exp.* 24 mm.

(38 g) *Piletocera holophæalis*, sp. n.

Head and thorax dark red-brown; abdomen paler red-brown; palpi whitish at base; pectus, legs, and ventral surface of abdomen whitish suffused with red-brown. Fore wing dark glossy red-brown, the interspaces with a greyish tinge except on costal area; antemedial line indistinct, dark brown, oblique to vein 1; a dark discoidal bar; postmedial line indistinct, red-brown defined on outer side by greyish, very slightly waved, oblique to vein 6, at

vein 3 retracted to lower angle of cell, then erect to inner margin; a faint slightly waved red-brown subterminal line; a terminal series of slight dark points. Hind wing whitish suffused with red-brown; a faint red-brown postmedial shade and slight dark terminal line.

Hab. DUTCH N. GUINEA, Wataikwa R. (*Wollaston*), 1 ♂, 1 ♀ type. *Exp.*, ♂ 28, ♀ 32 mm.

(39b) *Piletocera flavalis*, sp. n.

Head, thorax, and abdomen orange-yellow, the last with black line before anal segment; palpi whitish at base and with some black at tips; pectus, legs, and ventral surface of abdomen white tinged with yellow. Fore wing orange-yellow, the costa with series of small black spots; antemedial line black, oblique to submedian fold; an oblique black discoidal bar; postmedial line black, excurved from vein 5 to 3 near termen, then obsolescent and retracted to lower angle of cell, then distinct and excurved above inner margin; a terminal series of black bars; cilia white at base, black at tips. Hind wing orange-yellow; a black discoidal striga; postmedial line black, bent outwards between veins 5 and 2, then retracted to lower angle of cell and erect to inner margin; a terminal series of black bars, confluent towards apex; cilia white with a blackish line at middle and some brown at tips.

Hab. BR. C. AFRICA, Mt. Mlanje (*Neave*), 5 ♂, 6 ♀ type. *Exp.* 20 mm.

(41) *Piletocera analytodes*, sp. n.

♂. Vertex of head ochreous white and rufous, a bar between antennæ and the frons black; antennæ ochreous white ringed with rufous; palpi black mixed with some white and with the base of 2nd joint white; thorax ochreous white mixed with rufous and with tufts of spatulate black-tipped scales on metathorax; abdomen creamy white tinged with rufous and with rather diffused black band on basal segment; pectus, legs, and ventral surface of abdomen white tinged with rufous, the fore coxæ, femora, and tibiæ suffused with black in front. Fore wing creamy white suffused with rufous beyond the medial line and on postmedial area except towards costa and on inner half of terminal area; the base rufous and the rest of basal area black; antemedial line double, black, excurved below costa, then incurved and excurved above inner margin; a slight curved black medial line from costa to the antemedial line at vein 1, on which there is a slight black streak beyond it, a rufous band beyond the line except towards costa, and a quadrate rufous discoidal spot; postmedial line black, arising below the costa rather towards termen, excurved to vein 3, then oblique and slightly sinuous, slight black streaks before and beyond it on veins 6 to 3; a semicircular black patch on terminal area from apex to below vein 4, leaving a creamy white terminal line

from vein 4 to below vein 5; a white terminal line below vein ; cilia with black patches except at base, at apex, and middle. Hind wing creamy white, the terminal half suffused with rufous except at costa; some black irroration on basal half of inner area; a rufous discoidal bar and rufous line tinged with blackish from lower angle of cell to inner margin, incurved below submedian fold; a blackish shade from above vein 6 to vein 3 before the postmedial line, which is blackish, arising at vein 6, incurved below vein 2, and ending at tornus; a white terminal line; cilia suffused with rufous.

Hab. BISMARCK ARCH., Rook I. (*Meek*), 4 ♂ type. *Exp.* 26 mm.

Genus HYDROPIONEÆ, nov.

Type, H. mellicularis, Led.

Proboscis fully developed; palpi downcurved, about twice the length of head, the 2nd joint fringed with hair above and below, the 3rd prominent; maxillary palpi triangularly dilated with hair; frons oblique; antennæ of male annulated and ciliated. Fore wing with the apex somewhat produced, the termen excised below apex and excurved at middle; veins 3 and 5 from near angle of cell; 6 from below upper angle; 7 from angle; 8, 9, 10 stalked or 10 arising free then anastomosing with 8, 9; 11 from cell. Hind wing with vein 3 from before angle of cell; 4, 5 from angle; 6, 7 from upper angle, 7 anastomosing with 8.

(2) *Zagiridia rufalis*, sp. n.

♀. Head, thorax, and abdomen purplish rufous; pectus and ventral surface of abdomen white. Fore wing purplish rufous; an indistinct whitish subbasal line from subcostal nervure to vein 1; an indistinct slightly waved white antemedial line, slightly excurved at median nervure; a blackish point below middle of costa and another at lower angle of cell; postmedial line formed by whitish dashes in the interspaces, somewhat excurved to vein 4, then incurved; a curved subterminal series of white spots in the interspaces; a terminal series of blackish points; cilia whitish at tips. Hind wing purplish rufous; a whitish discoidal bar and black point at lower angle of cell; a blackish point on inner margin just before middle; a postmedial series of whitish dashes in the interspaces from costa to vein 2; a subterminal series of white spots; a terminal series of blackish points; cilia whitish at tips. Underside purplish rufous, the inner half of hind wing whitish.

Hab. D'ENTRECASTEAUX Is., Woodlark I. (*Meek*), 1 ♀ type. *Exp.* 22 mm.

(1a) *Clupeosoma violascens*, sp. n.

♀. Head, thorax, and abdomen reddish brown tinged with grey; palpi red-brown; pectus, legs, and ventral surface of abdomen whitish suffused with red-brown. Fore wing cupreous red-brown

glossed with purplish; an oblique dark brown antemedial line; a dark discoidal bar; postmedial line black-brown, rather oblique to vein 5, then erect; the termen and cilia black-brown with a silvery gloss. Hind wing cupreous red-brown glossed with purplish, the costal area whitish; some dark irroration below end of cell; a black postmedial line from vein 7 to submedian fold; the termen and cilia black-brown with a silvery gloss to vein 2.

Hab. BORNEO, Pulo Laut (*Doherty*), 1 ♀ type. *Exp.* 16 mm.

(1 b) *Clupeosoma noordimimalis*, sp. n.

♂. Head and thorax yellow suffused in parts with pink; abdomen yellow with diffused pale pink segmental bands; sides of frons and palpi red-brown, the latter white below towards base; pectus, legs, and ventral surface of abdomen white tinged with yellow, the fore femora and tibiae suffused with brown above. Fore wing pale yellow tinged with pink, the terminal area suffused with pink, the costa brown to end of cell; antemedial line formed by black scales, oblique; a slight black discoidal lunule; postmedial line black, very slightly excurved at middle, ending on inner margin near tornus; a terminal series of black striae. Hind wing white tinged with yellow, the area beyond lower angle of cell to the postmedial line tinged with pink from vein 5 to below vein 2, the terminal area suffused with pink to submedian fold; postmedial line black, straight, and ending on termen at submedian fold; a terminal series of black striae to vein 2; cilia tinged with pink to submedian fold.

Hab. GOLD COAST, Bibianaha (*Spurrell*), 1 ♂ type. *Exp.* 20 mm.

(1 c) *Clupeosoma brunneifusalis*, sp. n.

♀. Head and tegulae whitish suffused with purplish pink, the shoulders with red-brown stripes; thorax and abdomen pale red-brown, the latter with some rufous at base; antennae brown, ringed with white towards base; palpi red-brown, white at base; pectus, legs, and ventral surface of abdomen white suffused with red-brown, the tibiae and tarsi pure white, the fore tibiae with some black at base and a black band near extremity. Fore wing glossy greyish suffused with red-brown and slightly irrorated with darker brown; a curved black discoidal striga; postmedial line blackish, forming a slight black spot at costa, then very slightly waved and slightly bent inwards at vein 3, ending at tornus; a fine blackish terminal line and ochreous white line at base of cilia, followed by a dark line. Hind wing white tinged with red-brown, the area below and beyond the cell from discal fold to below vein 2 more suffused and irrorated with red-brown to the postmedial line, the terminal area suffused with red-brown to the submedian fold; postmedial line blackish, straight, from the costa to termen at submedian fold; a slight dark terminal line to vein 2; cilia with a white line at base followed by a dark line, the tips brown to vein 2.

Hab. DUTCH N. GUINEA, Snow Mts., Oetakwa R. (*Meek*),
1 ♀ type. *Exp.* 22 mm.

(4a) *Clupeosoma atristriata*, sp. n.

Sect. (*Clupeosoma*). Fore wing of male on upperside with streaks of scales on costa and veins 7, 6 from end of cell to the subterminal line and rough downturned hair beyond the subterminal line between veins 6 and 2.

♂. Head, thorax, and abdomen rufous with an opalescent gloss, the abdomen with white segmental lines; antennæ ringed with white; palpi pure white below towards base, with a black streak above the white continued to the tips and black above; throat pure white; pectus, legs, and ventral surface of abdomen rufous, the fore tibiæ with a black band before extremity which is white, the mid tibiæ and fore and mid tarsi pure white. Fore wing pale glaucous glossed with opalescent blue, the costa rufous to middle, then dark brown with the streaks below it black; postmedial line brown and angled outwards above vein 7, then yellowish white, angled outwards and defined on outer side by a purplish red line below vein 7, then slightly excurved to vein 2, where it is slightly incurved, then again slightly excurved and defined on outer side by a red-brown line; the postmedial area yellowish suffused with fiery rufous; the terminal area purple with a terminal series of minute dark brown spots defined by whitish; cilia pale rufous, dark brown at apex and with brown striga near base below apex. Hind wing pale glaucous glossed with opalescent blue, the costal and inner areas whitish; an oblique white postmedial band from vein 6 to vein 2 near termen defined on outer side by a slightly waved red line slightly defined on outer side by whitish; the terminal area purple from costa to vein 2, with a terminal series of minute purple-brown spots defined by white; cilia pale rufous to vein 2, then whitish.

♀. Fore wing with the costa rufous to apex and without the black streaks below it, the postmedial line waved, with a waved rufous line on its outer side defined by yellowish white points throughout, incurved below vein 2.

Hab. TIMUR, Dili (*Doherty*), 1 ♀; BISMARCK ARCH., Rook I. (*Meek*), 2 ♂ type. *Exp.* 16-20 mm.

(4b) *Clupeosoma rufistriata*, sp. n.

♂. Head, thorax, and abdomen rufous; antennæ slightly ringed with whitish; palpi white below towards base with dark streak above it and dark brown above; throat white; fore tibiæ with dark band near extremity which is white, the mid tibiæ and fore and mid tarsi pure white. Fore wing glaucous tinged with rufous and irrorated with red-brown, the costa rufous to end of cell, then darker brown with the streaks below it rufous; a blackish discoidal striga; postmedial line white, excurved above and below vein 7,

with some blackish scales before it and defined on outer side by a red-brown line, slightly excurved from discal fold to vein 2, then slightly incurved, the area beyond it pale rufous, the termen tinged with purple with a dark red-brown line on it towards apex, then a series of white striæ; cilia white tinged with rufous, dark glossy brown at apex. Hind wing pale glaucous tinged with brown, the costal and inner areas whitish; an oblique yellowish white postmedial band from vein 6 to vein 2 near termen, towards which it narrows, defined on outer side by a slightly waved purplish red line slightly defined on outer side by white; the terminal area pale purple to vein 2, the termen white with a series of rufous points; cilia whitish.

♀. Fore wing with the costa rufous to apex, the postmedial line lunulate and defined on outer side by a waved purplish red line throughout, a minutely crenulate blackish terminal line defining whitish points on termen, the cilia pale rufous.

Hab. DUTCH N. GUINEA, Snow Mts., Oetakwa R. (*Meek*), 1 ♂, 1 ♀ type. *Exp.* 18 mm.

(4d) *Clupeosoma astrigalis*, sp. n.

Fore wing of male on upper side with elliptical patch of androconia on vein 1 beyond the subterminal line.

♂. Head, thorax, and abdomen rufous with an opalescent gloss, the last with white segmental lines except towards extremity; antennæ with dark rings; palpi white below towards base; pectus and ventral surface of abdomen white tinged with rufous; legs white, the fore femora and tibiæ rufous, the latter with a dark band before extremities which are white. Fore wing pale rufous glossed with opalescent blue to the postmedial line, the terminal area purplish rufous; a slight brown discoidal striga; postmedial line yellowish white defined on outer side by a slightly waved brown line, incurved below vein 4, the costa beyond it dark brown; the patch of scales on vein 1 brown suffused with grey-white; a terminal series of dark brown points defined by pale rufous; cilia bright rufous, paler at tips. Hind wing pale rufous slightly glossed with opalescent black, the costal and inner areas whitish; an oblique yellowish white postmedial band from vein 6 to vein 2 near termen, towards which it narrows, defined on outer side by a slightly waved brown line; the terminal area purplish rufous to vein 2, with a series of red-brown bars on termen defined by pale rufous; cilia pale rufous, whitish at tips.

Hab. QUEENSLAND, Townsville (*Dodd*), 1 ♂ type. *Exp.* 16 mm.

(4e) *Clupeosoma glaucinalis*, sp. n.

♀. Head, thorax, and abdomen pale glaucous brown, the last ringed with white; antennæ brown; palpi white below towards base, defined above by a black streak and blackish above; pectus,

legs, and ventral surface of abdomen white, the fore femora and tibiæ rufous above. Fore wing pale glaucous brown faintly irrorated with darker brown; the costa darker brown; a dark point below middle of costa and striga on inner area; postmedial line white defined on outer side by a minutely waved dark line, incurved below vein 3; the area beyond it brownish ochreous shading to brown glossed with leaden grey before termen; the termen ochreous with a series of blackish points to vein 2; cilia ochreous. Hind wing pale glaucous irrorated with brown, the costal and inner areas white; a sinuous white postmedial line from vein 7 to submedian fold, defined on outer side by a minutely waved dark line, the area beyond it ochreous shading to brown glossed with leaden grey before termen; the termen ochreous with a series of blackish points to vein 2; cilia ochreous to vein 2, then whitish.

Hab. SINGAPORE (*Ridley*), 1 ♀; SUMBAWA (*Doherty*), 1 ♀ type. *Exp.* 14 mm.

(2) *Cenoloba cuprescens*, sp. n.

♀. Head, thorax, and abdomen pale red-brown; pectus, legs, and ventral surface of abdomen whitish tinged with rufous, the fore legs darker brown, the tarsi ringed with white. Fore wing whitish suffused with rufous with a cupreous tinge; a series of slight dark streaks on costa; a slight dark streak in end of cell; the two lobes somewhat banded with silvery white and with minute black points at termen. Hind wing banded cupreous rufous and silvery white, the two lobes each with a black point at termen.

Hab. SUMBAWA, virgin forest at 3000–5500 ft. (*Doherty*), 1 ♀ type. *Exp.* 10 mm.

SCOPARIÆ.

(5) *Microglossa philippinensis*, sp. n.

♂. Head and thorax red-brown mixed with some silvery whitish especially at extremity of patagia; abdomen pale red-brown with some whitish at base; antennæ whitish ringed with black; palpi black-brown, white at base; pectus, legs, and ventral surface of abdomen whitish suffused with red-brown, the fore legs blackish brown, the tarsi blackish brown ringed with white. Fore wing whitish thickly irrorated with iron-brown, the base suffused with iron-brown; antemedial line with an iron-brown shade on its outer side, oblique and sinuous to vein 1, then slightly incurved; a round iron-brown spot in middle of cell and X-shaped discoidal mark; postmedial line iron-brown, angled inwards below costa, then excurved to vein 2 where it is slightly angled inwards, then rather diffused; an iron-brown subterminal shade, angled inwards below costa, then bent outwards to middle of termen; a terminal series of minute iron-brown spots except towards tornus; cilia whitish with a series of slight red-brown spots. Hind wing white with a faint red-brown tinge, the termen browner except towards tornus.

Ab. 1. Much whiter; fore wing sparsely irrorated with iron-brown, slight subbasal dark spots below the cell and above inner margin, the antemedial line and marks in cell distinct, the postmedial line indistinct, slightly waved and hardly excurved at middle, the subterminal shade forming a distinct spot at middle of termen.

Hab. PHILIPPINES, Negros I. (*Whitehead*), 6 ♂ type. *Exp.* 16–20 mm.

(6) *Microglossa cupritincta*, sp. n.

♂. Head and thorax white tinged with cupreous brown and mixed with some black; abdomen white faintly tinged with red-brown; antennæ dark brown; frons with dark band; palpi, pectus, legs, and ventral surface of abdomen whitish suffused with red-brown. Fore wing white tinged with cupreous red-brown and irrorated with black; small black spots near base below the costa and cell; an antemedial patch of black scales on costa and obliquely placed spots formed by black scales below the cell and vein 1; a small black spot in middle of cell and irregular markings in and beyond the end of cell with a spot above them on costa; a pale curved postmedial line defined on each side by thicker black irroration; an incurved pale line from termen at discal fold to termen at submedian fold; cilia ochreous white with a maculate dark line at middle. Hind wing white faintly tinged with brown and with a slight brown terminal line except towards tornus.

Hab. DUTCH N. GUINEA, Mt. Goliath (*Meek*), 1 ♂ type. *Exp.* 18 mm.

(134) *Scoparia metacrossa*, sp. n.

Hind wing of male on upperside with fringe of downcurved hair from above middle of vein 2 and tuft of hair from above middle of vein 1, a fovea surrounded by fringes of short hair on termen above vein 1.

♂. Head and thorax bright rufous; abdomen whitish suffused with rufous. Fore wing bright rufous mixed with some whitish except on terminal area which has a cupreous gloss; a dark red-brown antemedial line, oblique to median nervure, then inwardly oblique; a whitish annulus in middle of cell, incomplete above, some darker brown beyond it in end of cell; a slight inwardly oblique dark postmedial line from costa to vein 6; an oblique rather diffused dark line defined on inner side by whitish suffusion from apex to inner margin beyond middle; a rather maculate dark terminal line; cilia creamy white at base, rufous at tips. Hind wing whitish suffused with rufous, the fovea and slight fringes of hair on termen above vein 1 dark brown.

Hab. DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♂ type. *Exp.* 16 mm.

(69a) *Scoparia strigigramma*, sp. n.

♂. Head white faintly tinged with brown; thorax pale red-brown mixed with some whitish and black; abdomen whitish suffused with red-brown; antennæ pale brown; palpi dark brown, white above; pectus, legs, and ventral surface of abdomen whitish suffused with brown. Fore wing whitish tinged with red-brown and irrorated with black scales forming a diffused streak in submedian fold to below end of cell; a slight diffused black spot in middle of cell and streak in end of cell; a postmedial series of minute black streaks, excurved below costa, then oblique; the veins towards apex slightly streaked with black; a terminal series of minute black spots. Hind wing glossy white faintly tinged with brown.

Hab. PERU, Agualani (*Ockenden*), 1 ♂ type. *Exp.* 20 mm.

(75c) *Scoparia atricuprea*, sp. n.

♂. Head and thorax black-brown with a cupreous gloss; abdomen white tinged with cupreous brown; palpi pure white below at base; pectus, legs, and ventral surface of abdomen cupreous brown mixed with whitish, the fore legs black-brown, the tarsi banded with white. Fore wing black-brown with a cupreous gloss and irrorated with bluish white scales; antemedial line white, excurved to median nervure, then incurved; a minute white spot in middle of cell and obscure band of blue-white irroration beyond it; postmedial line blue-white, interrupted at middle, excurved below costa and between veins 4 and 2 to near termen, slightly angled inwards at submedian fold; a blue-white subapical patch and series of dark cupreous brown spots before a slight waved white terminal line; cilia ochreous with a brown line near base and the tips brown towards apex. Hind wing white tinged with reddish brown especially on terminal area except towards tornus; cilia with a brown line near base.

Ab. 1. Fore wing with the medial area white irrorated with black-brown, a black spot on costa on outer side of antemedial line, spot in middle of cell and rather uncinat spot below the cell.

♀. Hind wing suffused with brown, the base, cell, and costal area to beyond the cell whiter.

Hab. JAMAICA, 1 ♀; COLOMBIA, Valparaiso (*H. H. Smith*), 1 ♂, Minca (*H. H. Smith*), 5 ♂ type. *Exp.* 16–20 mm.

(114a) *Scoparia cæruleotincta*, sp. n.

♀. Head and thorax white very faintly tinged with blue, the thorax with a black band behind the tegulæ and some black on dorsum; antennæ cupreous brown lightly ringed with white, the basal joint with black point on inner side; palpi white, the 2nd

joint with oblique black fascia, the maxillary palpi ringed black and white; pectus, legs, and ventral surface of abdomen white mixed with blackish. the fore legs black with white band at extremity of tibiæ and bands on tarsi. Fore wing white very faintly tinged with blue; an obliquely curved black subbasal band; antemedial line black, forming a patch at costa and excurved between submedian fold and vein 1; orbicular represented by a curved black striga on its inner side and oblique black bar on outer; reniform black, figure-of-eight shaped, incomplete above and below; a black spot below middle of cell and some irroration on medial part of inner margin; postmedial line black, strong and slightly excurved towards costa, excurved at middle, then very oblique and slightly sinuous, a bar beyond it from costa and irregular patch from vein 3 to inner margin; a slight black spot on termen below apex, a conical patch at middle, then a terminal black line to vein 1; cilia white with a series of slight blackish spots near base and some brown at tips at apex. Hind wing white faintly tinged with brown, more strongly on terminal area except towards tornus; traces of a white postmedial line from costa to submedian fold, slightly excurved at middle; cilia white. Underside of fore wing brown, the inner margin white, the costa white towards apex with a slight dark subterminal spot; hind wing white, a slight brown discoidal spot, postmedial line from costa to vein 5 and minute black spot on termen at vein 5.

Hab. CANARIES, Tenerife, Las Mercedes (*Walsingham*), 1 ♀ type. *Exp.* 18 mm.

(122 a) *Scoparia phæopalpia*, sp. n.

♂. Head, thorax, and abdomen white suffused with red-brown; antennæ brownish white ringed with dark brown; palpi very dark cupreous brown, pure white below towards base; pectus, legs, and ventral surface of abdomen white tinged with red-brown, the tarsi ringed with brown. Fore wing white slightly tinged with cupreous brown and sparsely irrorated with black-brown; a dark cupreous brown subbasal patch below the cell; two oblique black-brown antemedial lines, the outer with some black-brown beyond it in the cell; a black-brown spot in the cell towards extremity and a spot below the cell; some slight black-brown marks beyond the cell; postmedial line black-brown, strong towards costa, angled inwards below costa, excurved at middle, then oblique and indistinct; a subterminal black-brown spot on costa and slight mark angled inwards above inner margin; a terminal series of small black-brown spots, reduced to points below vein 4; cilia white with series of slight red-brown spots towards tips. Hind wing white with a faint rufous tinge especially on apical area.

Hab. NATAL, Esteourt (*Hutchinson*), 2 ♂ type. *Exp.* 20 mm.

XXXI.—On the Skull of *Tritylodon longævus*, Owen.
By Dr. BRANISLAV PETRONIEVICS.

[Plate X.]

SINCE Owen described in 1884, for the first time as mammalian, the skull of the single specimen of *Tritylodon* existing in the British Museum, several authors have re-examined his statements. Seeley, in 1888, declared *Tritylodon* to be a "bunotheroid Rodent"; but in 1894, after his discovery of *Gompholontia*, he gave up this opinion and declared *Tritylodon* a "theriodont Reptile" or as "intermediate between Mammals and Theriodonts." R. Broom, in 1904, showed that the reasons of Seeley for the statement that *Tritylodon* was a reptile are not tenable. In 1910, after having studied the specimen, Broom established the presence of new sutures between bones which had been wholly overlooked by the earlier observers, and so reinforced his opinion that *Tritylodon* is a true mammalian.

Having examined the specimen at the end of last year while in London, I believe that some new sutures can be made out, and that the limits between the bones are somewhat different from those established by Broom. A new preparation of the specimen has also cleared up some controversial points.

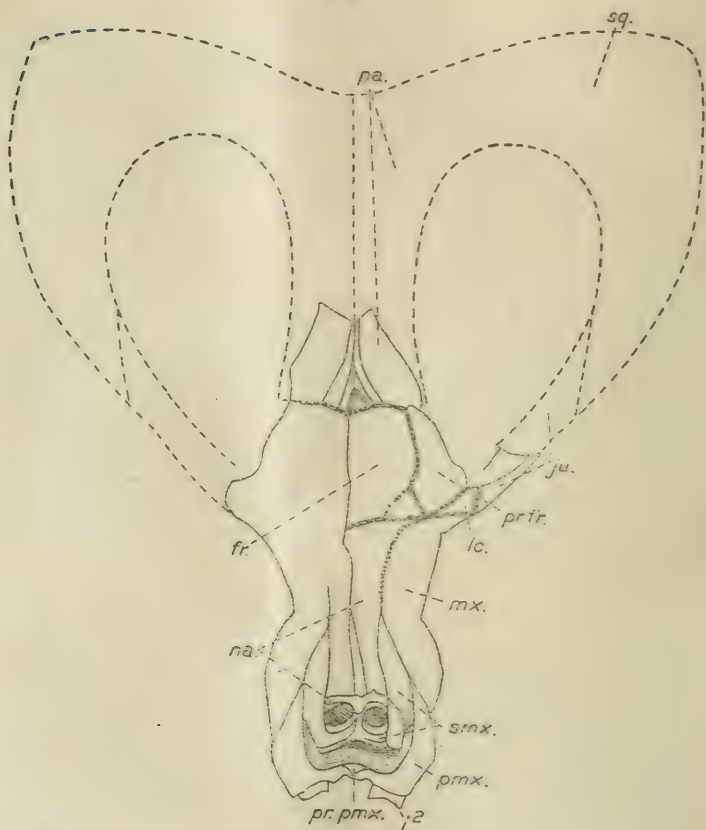
Text-fig. 1 shows the upper view of the skull. The plainest suture is that separating on the left side for some distance the nasal from the maxillary. In the front part of this suture begins another, which is for the first time plainly to be seen only with a magnifying-glass (it lies just above a zig-zag crack). The prolongation of this latter suture on the right is not clearly indicated, but is probable. If so, the whole would separate the nasal from the frontal; but it is not impossible that the visible part separates the lacrimal from the nasal.

The sutures separating the prefrontal from the frontal and lacrimal are doubtful or not at all indicated. The right side is so damaged that only the suture bounding the maxillary is to be seen for some distance.

The septomaxillaries, first observed by Broom, are now, after the new preparation, plainly (comp. text-fig. 1 and the photograph of the nares in Pl. X. fig. 1) to be seen. They limit the nares laterally, cross them from below, and send a short joint process above, which seems to meet in the middle

with the forward process of nasals (or, perhaps, with part of the ossified internasal septum) from above, so that the bone

Fig. 1.



Skull of *Tritylodon*, upper view, $\frac{2}{3}$ nat. size. —, probable sutures; - - - -, possible suture (between *fr.* and *prfr.*);, restored parts.

pa., parietal; *sq.*, squamosal; *ju.*, jugal; *fr.*, frontal; *prfr.*, prefrontal; *lc.*, lacrimal; *na.*, nasal; *mx.*, maxillary; *smx.*, septomaxillary; *pmx.*, premaxillary; *pr.pmx.*, process of the premaxillaries; *i.2*, second upper incisor.

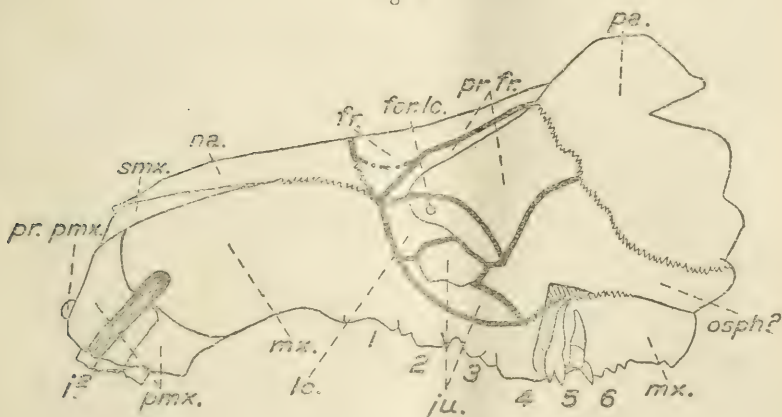
vertically separating the two nares seems to be composed of these two parts. Between the front part of premaxillaries

and the septomaxillaries there is a gap, so that the nares are wholly separated only horizontally*.

The suture separating the frontals from the parietals is not plainly to be seen; but it is probable that it lies before the groove in the front of parietal bones. Unfortunately the foramen parietale could not be established in this groove by the new preparation; but it seems to me still to be possible.

Text-fig. 2 shows the lateral view of the skull from the left side, but the sutures have been completed from the right side.

Fig. 2.



Skull of *Tritylodon*, left side, nat. size. —, probable sutures;
 ----, possible suture (between *fr.* and *pr.fr.*).

pa., parietal; *pr.fr.*, prefrontal; *fr.*, frontal; *for.lc.*, lacrimal foramen;
na., nasal; *smx.*, septomaxillary; *pr.pmx.*, process of the premaxillaries;
pmx., premaxillary; *mx.*, maxillary; *lc.*, lacrimal; *ju.*, jugal;
osph., orbitosphenoid; *i.*², second upper incisor; 1-6, postcanine teeth.

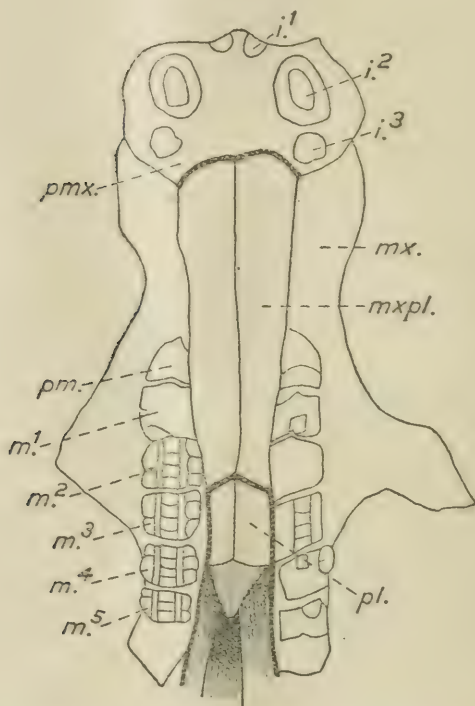
The suture separating the parietal bone from prefrontal and bounding it from below is plainly indicated † and was observed

* Broom's contention that "there is no evidence that the nares have been separated by a complete internasal process of the premaxillaries" (comp. Broom, 1910, p. 763) has been confirmed by the new preparation, which shows a mode of division of the nares quite different from that in the theriodont Reptiles and without parallel in Mammals.

† As this suture is on the right side going up to the front part of the parietal bone, no doubt can be entertained about the lateral continuity of this whole bone on the right side (on the left side the bone is far more fractured in the middle than on the right side). So that Seeley's supposition that the two bones diverging from the median crest laterally are the posterior prolongations of the postfrontals must be wholly rejected. Comp. Seeley, 1895, p. 1026 s.

by Broom. The other sutures indicated in the figure are rather doubtful, the best established being that bounding the maxillary from above, observed by Broom. The bone between this suture and the suture bounding the parietal from below I suppose to be the orbito-or alisphenoid. Broom

Fig. 3.



Skull of *Tritylodon*, underside, nat. size. —, probable sutures.

i.1-i.3, upper incisors; *pmx.*, premaxillary; *mx.*, maxillary; *mxpl.*, maxillopalatine; *pl.*, palatine; *pm.*, premolar; *m.1-m.5*, upper molars.

takes it to be a prolongation of the parietal bone, having supposed that the two bones meeting in a median crest are frontals*.

* I see no serious reason why these two bones should be frontals, even if the suture separating the frontal from the nasal would prove to be

On the underside of the skull (text-fig. 3) the sutures separating the premaxillaries from the maxillaries and the palatine processes of the latter are almost certain (comp. Owen, 1884, p. 147) ; but the suture between the palatines and the maxillaries is very doubtful.

I have still to add that I can confirm the statement of Broom (comp. Broom, 1910, p. 762) that there are in *Tritylodon* not two but three incisors. Indeed, in the front of the two broken great incisors and near to the point where the two premaxillaries are meeting one another there are two small teeth-sockets (text-fig. 3). But Broom's statement (*ib.* p. 762) that there are seven and not six molars in *Tritylodon* I cannot accept, because the limit of the last molar on the right side is a sharp one, and no plain trace of a molar behind it is to be seen. I suppose, in consequence, the dental formula of *Tritylodon* to be $i\ 3, pm\ 1, m\ 5^*$.

According to my preceding statements, and to the previous statements of Owen, Seeley, Osborn, and Broom, I add here, in conclusion, a review of the mammalian and reptilian characters of *Tritylodon*.

I. Mammalian Characters.

1. Divided roots of molar teeth ;
2. Multituberculate teeth ;
3. Straight and parallel rows of teeth ;
4. No postfrontal bone.

From these four characters, the first is still the best proof for the mammalian character of *Tritylodon*, no theromorphous reptile being known with divided teeth-roots. But, as some doubts have been expressed about this division †, the preparation of the molar tooth in *Tritylodon* by Owen has been somewhat enlarged, and the new preparation shows (comp. the photograph in Pl. X. fig. 2) that no doubt about that division can be entertained, the bone between the two roots undoubtedly not being dentine (it has the same colour as the bone in front of the forward root). As a new corroborative proof

wrong. The posterior part of the skull would be in both cases almost the same (comp. the restoration of it in text-fig. 1 with the restoration of Broom in Broom, 1914, fig. 1, p. 119).

* In 1914 Broom gives the dental formula of *Tritylodon* as being probably $i\ 3, c\ 0, p\ 4, m\ 3$ (comp. Broom, 1914, p. 120).

† Comp. H. Gadow, 'Amphibia and Reptiles,' London, 1901, p. 309.

of this last statement I add here in Pl. X. fig. 3 a photograph of two newly prepared molar teeth of *Diademodon browni* with undivided roots *, and in Pl. X. fig. 5 a photograph of the newly prepared molar tooth of *Cynognathus crateronotus*, showing undivided root and a groove on the outer surface, indicating the beginning of a partial division of this root, as it seems, throughout its whole length.

II. Reptilian Characters.

1. Divided nares;
2. Prefrontal bone †;
3. Frontal bone not bounding the orbit.

III. Characters both Mammalian and Reptilian.

1. Septomaxillary bones;
2. The terminal position of the anterior nares;
3. The backward position of the posterior nares;
4. Considerably diverging parietal bones;
5. Orbito- or alisphenoid (or orbitopalatine?);
6. No postorbital bar;
7. Brain-case antero-laterally closed.

If we try to separate in this last group the characters that are primarily reptilian in *Tritylodon* from those which are probably purely mammalian, we should regard only the existence of the septomaxillary bone as a pure reptilian character (common both to *Tritylodon* and to Monotremes). So that *Tritylodon* is to be regarded, in the first place, as a mammal, but as a mammal with some undoubtedly reptilian characters, the *most primitive* of the known Mammals. With its mixed characters, *Tritylodon* is a direct proof that the Mammals have their origin in Reptiles, most probably in theriodont Reptiles.

* Seeley mentions (comp. "On *Diademodon*" in Philos. Trans. 1895, pp. 1029-1041, figs. 5-10) three isolated molar teeth of *Diademodon* with undivided roots, but they seem to belong to lower molars. I add here in Pl. X. fig. 4 another photograph of two single-rooted V-shaped teeth of *Diademodon* in section from the specimen R. 3695 in the British Museum (mentioned by Mr. Watson, "The Skull of *Diademodon*," in Ann. & Mag. Nat. Hist. (8) viii. 1911, p. 314), one with open and the other with closed pulpa.

† The existence of a prefrontal bone in mammals has been affirmed (comp. R. Cunningham, "Note on the Presence of Supernumerary Bones occupying the Place of Prefrontals in the Skull of certain Mammals," in Proc. Zool. Soc. Lond. 1889, pp. 76-77).

At the end of this paper I desire to express my thanks to Dr. Woodward and Dr. Andrews, of the British Museum, for the loan of the new preparations (executed by Mr. Hall), and to Dr. Andrews for some valuable help.

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7. R. BROOM. "On *Tritylodon* and on the Relationships of the Multituberculata," in Proc. Zool. Soc. Lond. 1910, pp. 760-768.
8. R. BROOM. "On the Structure and Affinities of the Multituberculata," in Bull. Amer. Mus. Nat. Hist. vol. xxxiii. 1914, pp. 115-134.

EXPLANATION OF PLATE X.

- Fig. 1.* The front part of the skull of *Tritylodon*, showing the nares.
Fig. 2. Molar tooth of *Tritylodon* with divided root.
Fig. 3. Two molar teeth of *Diademodon browni* with undivided roots.
Fig. 4. Two single-rooted V-shaped teeth of *Diademodon*, R. 3605 in the British Museum, the left with open and the right with closed pulpa.
Fig. 5. Molar tooth of *Cynognathus crateronotus* with undivided root.

XXXII.—*Notes on Fossorial Hymenoptera*.—XXIX. *On new Ethiopian Species*. By ROWLAND E. TURNER, F.Z.S., F.E.S.

Family Crabronidæ.

Subfamily BEMBECINÆ.

Bembex atropinosus, sp. n.

♂. Niger; mandibulis basi, labro, clypeo, fronte inter antennas, orbitis, macula curvata utrinque infra ocellos, scapo subtus, flagello subtus pedibusque pallide flavis; femoribus tibiisque

supra nigro-lineatis; metatarso antico spinis nigris; segmentis dorsalis 1-6 fascia transversa lata, ventralibus 2-5 macula transversa utrinque griseo-luteis; alis hyalinis, venis nigris.

♀. Mari simillima; clypeo macula basali nigra utrinque; flagello supra brunneo, pronoto anguste scutelloque anguste margine posteriore griseo-luteis; segmento dorsali sexto basi nigro, apice ferrugineo, tarsis anticis spinis omnibus nigris; femoribus tibiisque supra ferrugineo intaminatis; tegulis basi flavo-maculatis.

Long., ♂ 18, ♀ 17 mm.

♂. Apical joint of the flagellum longer than the penultimate, moderately curved and blunt at the apex; the penultimate and two preceding joints bluntly produced at the apex beneath; the seventh and eighth joints with a minute tubercle at the base beneath. Fore tarsi not dilated; the basal joint with eight spines, the six basal spines stout and black and of uneven length, the first and sixth being much shorter than the others, the two apical spines short and yellow, widely separated from the basal row. Intermediate femora strongly serrated beneath, intermediate tibiæ not produced at the apex, basal joint of the intermediate tarsus normal. Second sternite with a prominent carina on the apical half; sixth sternite with a triangular prominence at the apex; seventh with a longitudinal carina. Seventh tergite narrowed to the apex, where it is narrowly truncate. Claspers broad, concave above, ciliate on the outer margin, the apex narrowed and deflexed, not pointed or hooked. Fore wings a little more than twice as long as the breadth of the thorax; one vein only emitted from the apex of the median cell.

♀. Second sternite very closely and finely punctured, not shining in the middle; sixth tergite rather narrowly rounded at the apex. Basal joint of the fore tarsus with eight black spines, the spines in an even row, long and stout, the basal one only short.

Hab. Willowmore, Cape Province (*Dr. Brauns*), December.

This very distinct species is perhaps nearest to *albofasciata*, Sm., though differing much in the structure of the antennæ and genitalia, and in the spines of the fore tarsus. The genitalia somewhat resemble those of *B. bubalus*, Handl.

Subfamily *LARRINÆ*.

Tachytes exclusiva, sp. n.

♀. Nigra; mandibulis, apice excepto, clypeoque dimidio apicali

fusco-ferrugineis; palpis, antennis, tegulis pedibusque ferrugineis; fronte clypeoque pallidissime aureo-pubescentibus; segmentis dorsalibus secundo, tertio quartoque angulis apicalibus late argenteo-pubescentibus; pygidio fusco-ferrugineo setoso; alis flavo-hyalinis, venis ferrugineis.

♂. Feminae similis; fronte clypeoque laete aureo-pubescentibus. Long., ♀ 23, ♂ 22 mm.

♀. Clypeus broadly subtruncate at the apex; galea distinctly longer than broad, rounded at the apex; palpi not elongate. Second and third joints of the flagellum subequal; eyes separated on the vertex by a distance about equal to the length of the second joint of the flagellum. Vertex very minutely and closely punctured, with a low longitudinal carina from the occiput not reaching to the ocellar space. Posterior slope of the median segment irregularly transversely striated; a small smooth triangular depression at the apex of the dorsal surface of the segment, which is finely rugulose and about half as long again as the scutellum. Dorsal surface of the abdomen shining, closely and minutely punctured; pygidial area broadly rounded at the apex. Sternites 2-4 shining, with large scattered punctures. Basal joint of the fore tarsus with six rather short and stout spines; spur of the hind tibia longer than the basal joint of the hind tarsus. Second and third abscissæ of the radius subequal; the space between the recurrent nervures on the cubitus equal to the second abscissa of the radius.

♂. Clypeus very broadly rounded at the apex; eyes very close together on the vertex, separated by a distance scarcely equal to the length of the first joint of the flagellum. Seventh dorsal segment broadly rounded at the apex; eighth ventral segment subtruncate, very feebly emarginate in the middle, the angles not produced. Sternites shining, sparsely punctured, but more closely and finely than in the female.

Hab. Yapi, Gold Coast (*J. J. Simpson*), November 1916.

This is near *T. testaceinerva*, Cam., differing in the much sparser pubescence of the thorax and median segment, in the distinctly longer galea, in the presence of a carina on the vertex of the female, in the broader pygidial area, and in the distinctly sparser punctures of the sternites; the seventh tergite of the male is also much broader.

Tachytes obliqua, Sm.

Larrada obliqua, Sm. Cat. Hym. B.M. iv. p. 281 (1856). ♂ (as ♀).

This is a *Tachytes* somewhat allied to *silverlocki*, Turn.,

and *nigroannulatus*, Bisch. The posterior ocelli are not as long as in most species of the genus. Eighth sternite rounded at the apex. I overlooked this species in my recent revision of the Ethiopian *Tachytes*.

Tachytes braunsi, sp. n.

♂. Niger, albo-pilosus; palpis brunneis; tarsi ferrugineis, basi infumatis; segmentis dorsalibus 1-4 fascia apicali argenteo-pubescente; segmento dorsali septimo argenteo-pubescente; segmento ventrali octavo apice truncato; alis flavo-hyalinis, venis ferrugineis, tegulis pallide luteis.

♀. Mari simillima; segmento dorsali sexto pallide aureo-pubescente.

Long., ♂ 14, ♀ 15 mm.

♂. Clypeus very broadly rounded at the apex, clothed with dull silver pubescence which extends on to the front. Eyes separated on the vertex by a distance slightly exceeding the length of the second joint of the flagellum; the vertex closely and finely punctured. Thorax and median segment rather sparsely clothed with erect whitish hairs; median segment nearly twice as long as the scutellum, with a shallow longitudinal sulcus. Second sternite very closely and rather finely punctured; eighth sternite truncate at the apex, the angles not produced; seventh tergite broadly rounded at the apex. Basal joint of fore tarsus with four spines. Second and third abscissæ of the radius subequal, shorter than the first; the third cubital cell on the cubitus extending a little beyond the apex of the radial cell. Galea broader than long.

♀. Eyes separated on the vertex by a distance equal to the combined length of the two basal joints of the flagellum; basal joint of the fore tarsus with four spines; second sternite more finely punctured than in the male; third sternite shining, with large scattered punctures; sixth tergite elongate-triangular, pointed at the apex.

Hab. Willowmore. Cape Province (*Dr. Brauns*), November and December.

This somewhat resembles *T. erymnis*, Turn., but differs in the number of spines on the fore metatarsus, in the colour of the pubescence on the thorax, in the deeper colour of the wings, and in the shape of the apical segments in both sexes.

Tachysphex punctatus, Sm.

Larrada punctata, Sm. Cat. Hym. B.M. iv. p. 252 (1856). ♂ (as ♀).

The eyes are separated on the vertex by a distance equal

to the length of the two basal joints of the flagellum in the female and by a distance equal to twice the length of the second joint in the male. Pygidial area of the female strongly punctured, long and narrow, pointed at the apex. The median segment is opaque and coriaceous.

Hab. Willowmore, Cape Province (*Dr. Brauns*).

This is a true *Tachysphea* of rather slender build, the anterior femora of the male being emarginate, though not as strongly as in some species, and the tarsal comb of the female very long. The dark fuscous wings distinguish it from other black South-African *Tachysphea*.

Tachysphea marshalli, sp. n.

♀. Nigra; mandibulis basi, clypeo, flagello articulis tribus basalibus, tegulis, segmento abdominali sexto, femoribus, tibiis tarsisque rufo-testaceis; alis fusco-violaceis, venis nigris; fronte, clypeoque basi aureo-pubescentibus.

♂. Feminae similis; flagello nigro; segmento dorsali sexto nigro, septimo rufo-testaceo.

Long., ♀ 15, ♂ 11 mm.

♀. Clypeus broadly subtruncate at the apex, with two minute teeth at the apical angles, shining and sparsely punctured. Eyes separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum. Thorax very finely and closely punctured; median segment a little longer than the mesonotum, finely longitudinally rugulose, with short striæ at the extreme base; the surface of the apical truncation strongly transversely striated, with a deep median sulcus. Abdomen microscopically punctured; the pygidial area lanceolate, pointed at the apex, with small scattered punctures. Radial cell rounded at the apex; second abscissa of the radius longer than the third; the space between the recurrent nervures on the cubitus equal to the third abscissa of the radius. Tarsal comb long; eight spines on the fore metatarsus.

♂. Eyes separated on the vertex by a distance equal to the combined length of the two basal joints of the flagellum; dorsal surface of the median segment coriaceous; anterior femora emarginate at the base; tarsal comb much shorter than in the female; seventh tergite subtruncate at the apex; eighth sternite widely emarginate, the angles forming spines.

Hab. Salisbury, Mashonaland (*G. A. K. Marshall*), April. A variety with the apical segment in both sexes black, and

the sculpture of the median segment in the female less developed, occurs in N.E. Rhodesia and Nyasaland: Luangwa River, July to September (*S. A. Neave*); Mlanje, 2300 ft., October (*S. A. Neave*).

This is one of the most conspicuously coloured species of the genus.

Notogonia dentipes, sp. n.

♀. Nigra; scapo, tegulis, tibiis anticis, tibiisque intermediis posticisque subtus ferrugineis; clypeo, fronte, mesonotoque lateribus aureo-pubescentibus; segmento mediano sparse, pleuris, segmentisque dorsalibus 1-3 fascia apicali pallide aureo-pubescentibus; area pygidiali fusco-ferrugineo-setoso; alis pallidissime flavo-hyalinis, venis ferrugineis.

Long. 14 mm.

♀. Clypeus shining on the apical margin and subtruncate. Second and third joints of the flagellum subequal; eyes separated on the vertex by a distance not quite equal to the length of the second joint of the flagellum. Thorax subopaque, smooth; median segment very little longer than the breadth in the middle, slightly convex, indistinctly transversely striated, with a low carina from the base not quite reaching the apex, the surface of the posterior truncation with a median sulcus and with transverse striæ at the sides. Abdomen opaque; pygidial area triangular, narrowly rounded at the apex, finely rugose. Tarsal comb short; four spines on the fore metatarsus; a small blunt tooth on the middle of each tarsal unguis. Fourth abscissa of the radius as long as the first, a little longer than the second and third combined; the second very short, but a little longer than the space between the recurrent nervures on the cubitus. Radial cell narrowly truncate at the apex.

Hab. Obuasi, Ashanti (*Dr. W. M. Graham*).

This belongs to the group of *cræsus*, Sm., but differs in the colour of the wings and legs, in the shorter tarsal comb, in the much sparser pubescence, and in the shorter median segment. The pygidial area is similar to that of *cræsus*, not truncate at the apex as in *deceptor*, Turn.

Notogonia neavei, sp. n.

♀. Nigra; mandibulis, apice excepto, tarsisque fusco-ferrugineis; alis sordide hyalinis, venis nigris; fronte, clypeo, segmentisque dorsalibus 1-3 fascia indistincta apicali argenteo-pubescentibus; unguiculis dente armatis.

Long. 16 mm.

♀. Clypeus opaque, the apical margin shining and very narrowly and shallowly excised in the middle; eyes separated on the vertex by a distance equal to about two-thirds of the length of the second joint of the flagellum. Mesonotum opaque, pruinose; with a delicate impressed line from the middle of the anterior margin, not reaching more than halfway to the middle of the segment; a similar short impressed line on each side before the tegulæ. Scutellum smooth and slightly shining. Median segment longer than broad, margined at the apex; transversely striated, the striæ distinct at the base, obsolete on the apical half; a very delicate longitudinal carina from the base not reaching the apex; the surface of the posterior truncation with a deep median sulcus, transversely striated at the sides, the striæ obsolete in the middle. Abdomen pruinose; pygidial area rather broadly truncate at the apex, finely rugose, sparsely clothed with very short pubescence which changes according to the light from fuscous to pale golden, a few strong fuscous setæ on the apical margin. Basal sternites pruinose; the second at the base with the usual structure of the genus. Comb of the anterior tarsus rather short, the basal joint with four spines; tarsal unguis long, with a small triangular tooth near the middle. First abscissa of the radius as long as the second and third combined, the fourth longer than the first; radial cell narrowly truncate at the apex; recurrent nervures very narrowly separated on the cubitus.

Hab. Mlanje, Nyasaland (*S. A. Neave*), December.

This may be distinguished from other described species of similar colouring by the tooth on the tarsal unguis.

Other localities are:—Bomaru, Sierra Leone (*J. J. Simpson*), August; Oshogbo, S. Nigeria (*Dr. T. F. G. Mayer*); Entebbe, Uganda (*C. G. Gowdey*), June.

Liris africana, sp. n.

♀. Nigra; scapo subtus ferrugineo; fronte clypeoque argenteo-pubescentibus; area pygidiali fusco-aureo-pubescente; alis nigro cæruleis.

Long. 23 mm.

♀. Clypeus with a carina from the base to the apex, slightly produced in the middle of the apical margin and with a minute tubercle on each side at the apical angles. Eyes separated on the vertex by a distance equal to the length of the second joint of the flagellum, which is distinctly longer than the third. Thorax subopaque, coriaceous. Median

segment as long as the mesonotum and scutellum combined, with a low carina from the base not reaching the apex, transversely striated, distinctly convex, the sides almost parallel, longer than broad, vertically truncate posteriorly; the surface of the truncation transversely striated, with a median sulcus; the sides of the segment vertically striated. Abdomen slightly pruinose, with faint traces of apical fasciæ of silvery pubescence on tergites 2-4; pygidial area large, elongate-triangular, narrowly truncate at the apex, a row of stiff setæ on the apical margin. Sternites rather sparsely and finely punctured; second sternite convex, depressed on each side at the base as in the genus *Notogonia*. Tarsal comb long, four spines on the basal joint of the fore tarsus; ungues very long. Recurrent nervures very near together on the cubitus; second abscissa of the radius less than half as long as the third.

Hab. Bulawayo, Rhodesia (*G. Arnold*), December.

This is very like *Notogonia gowdeyi*, Turn., but the mandibles are entire as in *Liris*. It also closely resembles the Oriental species of *Liris* allied to *ducalis*, Sm.

Dimorpha flavipennis, sp. n.

♂. Niger; abdomine rufo-testaceo; segmento basali secundo basilate nigro-fasciato; alis flavo-hyalinis, venis ferrugineis. Long. 11 mm.

♂. Clypeus and front closely punctured, covered with white pubescence. Anterior ocellus situated in a shallow depression, larger than the posterior pair which touch the eyes. Joints of the flagellum a little widened from the base to the apex, the second half as long again as the third. Eyes touching on the vertex. Mesonotum and mesopleuræ very closely and not very finely punctured, the punctures more or less confluent; scutellum shining, more sparsely punctured. Median segment reticulate, with more or less indistinct longitudinal striæ, the sides of the segment very closely punctured. Abdomen smooth and shining; the sternites finely and sparsely punctured, and sparsely clothed with pale testaceous hairs. Radial cell oblique at the apex, long; the fourth abscissa of the radius almost as long as the first and third combined; second cubital cell pointed on the radius, first abscissa of the radius more than half as long as the third and twice as long as the distance between the recurrent nervures on the cubitus.

Hab. 30 miles from Magadi Junction, British East Africa (*F. G. Hamilton*), April.

This is larger than other Ethiopian species known to me, and may also be distinguished by the very different colouring of the wings and abdomen.

Subfamily *NITELINÆ*.

Miscophus rhodesianus, sp. n.

♀. Nigra; mandibulis basi, tibiis, tarsis, femoribus posticis, femoribusque intermediis subtus ferrugineis; alis hyalinis, anticis tertio apicali infumatis, venis nigris; abdomine parum cyaneo micante; fronte pilis chalcis sparsis; tegulis testaceis.

♂. Feminae similis; femoribus nigris; tibiis tarsisque fusco-ferrugineis.

Long., ♀ 4-6, ♂ 4 mm.

♀. Anterior margin of the clypeus smooth and shining, slightly porrect. Head opaque, coriaceous, with scattered, short, almost scale-like hairs; the eyes almost parallel. Thorax and median segment very finely rugose; a carina from the base of the median segment not reaching the apex, the posterior slope of the segment with a median sulcus. Pubescence of the thorax and median segment short and very sparse. Abdomen very finely and closely punctured. Tarsal comb long and black; the spines distinctly spatulate; calcaria black. The fuscous cloud on the fore wing commences in the second cubital cell, becoming gradually paler towards the apex of the wing.

♂. The tarsal comb is much reduced in length.

Hab. Bulawayo, Rhodesia (*G. Arnold*), June.

This is a stoutly built species, nearly allied to *kriechbaumeri*, Brauns, and *craniensis*, Brauns, differing from the former in the parallel inner orbits and in colour, from the latter in the much sparser pubescence and in the sculpture of the thorax.

Miscophus cyanescens, sp. n.

♂. Niger, gracilis; segmentis dorsalibus chalybeo micantibus; tarsis fusco-ferrugineis; alis hyalinis, venis nigris.

Long. 5 mm.

♂. Eyes distinctly convergent towards the vertex; antennæ rather stout. Head coriaceous, with very delicate sericeous white pubescence on the lower part of the front.

Pronotum nearly as long as the mesonotum, a little narrowed anteriorly, indistinctly and very finely transversely striated; the remainder of the thorax very finely granulate. Median segment longer than the mesonotum, narrowed posteriorly, the dorsal surface rather irregularly obliquely striated, with a carina from base to apex; the surface of the posterior truncation transversely striated, with a median sulcus. Abdomen microscopically punctured. The striae on the dorsal surface of the median segment are rather indistinct, the surface between them being more or less rugose.

Hab. Bulawayo, Rhodesia (*G. Arnold*), June.

Allied to *M. pseudonotogonia*, Brauns, but differs considerably in sculpture.

XXXIII.—*Descriptions and Records of Bees.*—LXXVII.

By T. D. A. COCKERELL, University of Colorado.

Epeolus bifasciatus obscuripes, subsp. n.

♂.—Length about 6 mm.

Greater part of scape blackish; antero-lateral corners of mesothorax entirely black; legs dark brown, tarsi paler and redder; band on first abdominal segment interrupted.

Medellin, Vera Cruz, Mexico (*H. H. Hyde*; Baker coll. 1785). U.S. Nat. Museum.

E. fumipennis, Say, is not identical with *E. bifasciatus*, Cresson, or even closely related.

Epeolus xanthurus, sp. n.

♂.—Length about 8 mm., anterior wing 7, with the aspect of an Odynerid wasp.

Black, with the mandibles (except basally), tubercles, tegulae, anterior tibiae in front, and all the tarsi ferruginous; eyes yellowish brown; inner orbits strongly converging below; antennae black, apical part of third joint red; face covered with appressed pale ochreous-tinted hair; thorax above with pale ochreous hair, the mesothorax thinly hairy all over, but with a large H rather obscurely indicated by denser hair; axillar teeth very short; postscutellum with middle third dark fuscous, lateral thirds cream-coloured,

these effects due to short dense pubescence; mesopleura shining and strongly punctured, but the upper part covered with dense brownish hair. Wings reddish hyaline, with a large suffused brownish cloud beyond marginal cell; stigma and nervures ferruginous; spurs light ferruginous. Abdomen short; basal segment with a large semilunar area of ochreous tomentum, but no apical band; second and following segments with very broad apical bands of clear reddish-fulvous tomentum, making the whole apical region appear yellow; apical part of venter similarly coloured.

Ecuador (Baker collection). U.S. Nat. Museum.

Closely allied to *E. cameroni*, Meade-Waldo, but distinguished by the pattern of the mesothorax, entirely clear red tegulae, red tubercles, and distinct cloud at apex of wing. My specimen of *cameroni* (determined by Meade-Waldo) is from Temax, Yucatan (*Gaumer*).

Epeolus rugulosus, sp. n.

♂.—Length about 10.5 mm.; anterior wing 7.5.

Black, including mandibles and tubercles, but third antennal joint bright ferruginous; eyes pale ochreous, brighter above; face rather broad; clypeus minutely and densely rugoso-punctate, not densely hairy: sides of face and region of antennae covered with ochreous hair, which is limited by a straight line from orbit to orbit just above antennae; upper border of prothorax with a broad band of dense bright ochreous hair, tubercles with paler hair; mesothorax densely punctured, with no discal ornaments, but an ochreous band of hair along sides and hind margin; axillar spines moderate, but sharp; scutellum with a median groove; postscutellum with thin pale hair right across; scutellum with a broad band of ochreous hair posteriorly; mesopleura with a transverse semilunar patch of pale hair above, but the greater part shining and strongly punctured; tegulae clear ferruginous. Wings hyaline, orange-tinted, dusky apically; stigma and nervures ferruginous. Legs black, with pale hair, spurs black. Abdomen elongate, the first two segments with a peculiar sculpture consisting of longitudinal rugae crossed by very fine lines; remaining segments brownish from a very delicate tomentum; first segment with a very large oblique ochreous hair-patch on each side, the two patches almost meeting in middle; no apical band on first segment, but second to sixth with broad bright ochreous entire hair-bands, becoming white at

extreme sides; band on second with no exterior lobes; ventral hair-tufts ochreous.

Comacho, Canal Zone, Panama, March 27 (*A. H. Jennings*). U.S. Nat. Museum.

An isolated species, somewhat related to *E. xanthurus*, but easily known by the sculpture of the abdomen and other characters. The wings are unusually short.

Triepeolus cuneatus, sp. n.

♂.—Length about 11 mm.

Similar to *T. helianthi*, Rob. Black, the markings pale ochreous; apical half of mandibles dark reddish; eyes light green; face densely covered with ochreous-tinted silvery hair; antennæ entirely black; mesothorax rugoso-punctate, the margins with a band of ochreous hair, while anteriorly are two large cuneate marks pointed caudad, leaving the black area approximately anchor-shaped; axillarspines rather short, pointed; mesopleura almost entirely covered with hair; tegulae black, the outer posterior region pallid. Wings dusky hyaline, stigma very small; nervures fuscous, basally ferruginous. Middle and hind femora and tibiae, and all the tarsi bright ferruginous; spurs black; first abdominal segment with a transverse black band, obliquely truncate at each end, connected in middle with a black triangular area on hind margin; black area on second segment also obliquely truncate at sides; apical band on second segment notched in middle, but those on third to fifth broad and quite entire; sixth segment dark seal-brown; seventh with a short band of ochreous hair on each side; apical plate with a bright ferruginous semilunar spot; ventral brushes pale reddish.

Meadow Valley, Mexico (*C. H. T. Townsend*). U.S. Nat. Museum.

Known from *T. helianthi* by the cuneate marks on thorax, the shorter black band on first abdominal segment, broader apical band on second, &c.

Triepeolus concinnus, sp. n.

♀.—Length about 11 mm.

Black, with pale ochreous markings; mandibles very dark reddish apically; eyes pale green; clypeus minutely rugoso-punctate, with scattered large punctures; ochreous hair in region of antennæ; antennæ entirely black; mesothorax with ochreous band at sides and behind, but not in

front ; two broad stripes, not very long, on anterior part of mesothorax, these completely isolated from the ochreous band ; axillar teeth short ; mesopleura with dense ochreous hair along anterior margin, and a broad band running across the middle, below this is a large quadrate black area ; tegulae black, the margin brownish. Wings dusky hyaline, nervures fuscous. Legs coloured as in *T. cuneatus*. Abdomen marked as in *T. cuneatus*, but apical band on first segment rather widely interrupted, and that on second sometimes interrupted ; segments 3 and 4 with entire bands ; fifth with a large ochreous patch on each side of the modified area ; last ventral segment straight in profile.

Meadow Valley, Mexico (*C. H. T. Townsend*). U.S. Nat. Museum.

Close to *T. cuneatus*, but on account of the different ornamentation of mesothorax it must be considered distinct. The eyes are yellow-green, not bluish green as in typical *helianthi*. In *helianthi* the black lower part of pleura is not enclosed by ochreous.

Triepeolus medusa, sp. n.

♀ (type).—Length about 11.5 mm.

Black, of the type of *T. helianthi* ; mandibles reddish in middle ; clypeus shining, finely punctured, a few indistinct large punctures ; region of antennae with ochreous hair ; third antennal joint dark reddish in front ; hair-markings of thorax and abdomen pale, faintly yellowish, almost greyish ; mesothorax with a narrow band along sides and behind, but not in front ; disc with two parallel broad stripes ; axillar spines small and obscure ; mesopleura with a band across middle, the black region below not enclosed ; tegulae piceous. Wings strongly dusky. Legs coloured as in *T. cuneatus* and *concinus*. Abdomen essentially as in *concinus*, bands on first and second segments interrupted, band on second segment with an elongated process directed cephalad on each side. Spurs black.

♂.—Face covered with pure silvery-white hair ; mesopleura covered with silvery-white hair ; parallel stripes of mesothorax less developed ; middle femora broadly black above ; first three abdominal bands interrupted, and the fourth with a linear interruption, not quite complete.

Federal District, Mexico, "7 and 8, 10." U.S. Nat. Museum.

The specific name was suggested by the black area on

thorax above, more or less resembling the outline of a medusa or jellyfish. The modified apical area of female abdomen is rather small. This is easily known from *T. helianthi* by the wide interruption of the apical band on first abdominal segment and the wider stripes on mesothorax; these latter are broad to the base (front), not slender and thus clavate as in *T. sublnatus*, Ckll.

Chalepogenus calcaratus (Cresson).

The known distribution is greatly extended by males from Sonsonate, Salvador, Aug. 24 (*F. Knab*), and Paraiso, Panama Canal Zone, Jan. 16 (*A. Busck*).

In the southern part of the range there is more black on the clypeus of the male. The species was described from Mexico.

Chalepogenus globulosus (Friesse).

Friesse described this from a single male from an unknown locality, calling it *Tetrapedia globulosa*. I have before me a male from Taboga I., Panama, July (*A. Busck*), and a female from Paraiso, Panama Canal Zone, May 11 (*A. H. Jennings*). The female closely resembles the male, but differs thus: face broader; clypeus ferruginous; front ferruginous except an obscure median stripe, and a flame-like upward extension (away from orbit) of each lateral mark; hind legs with ferruginous scopa. In both sexes the mesothorax has lateral as well as discal yellow stripes. The male has no brown fringes on the abdominal segments, but it agrees in general so well with Friesse's description that I believe it must be the same.

Exomalopsis globosa (Fabricius).

Females from Mayaguez, Porto Rico, Jan. 9 (*C. W. Hooker*, 68).

This species is readily known from the mainland *E. manni* and *zermanie* by the dark reddish stigma. The scopa of hind tarsi is very long and loose.

Exomalopsis vincentana, sp. n.

♀.—Length 6.5 mm.

Robust, black, shining; mandibles reddish in middle;

clypeus polished, irregularly punctured, and with a shallow quadrate subapical depression; antennæ dark, the flagellum obscurely reddish beneath, last joint flattened; mesothorax polished, with scattered minute punctures, and some larger ones, the pubescence short and scanty, mainly black, but whitish in front; prothorax, tubercles, and pleura with dull white hair; scutellum with black hair; tegulæ black. Wings dusky, subviolaceous, darker apically and in region of marginal cell; stigma large and reddish, nervures fuscous. Legs black, the small joints of tarsi ferruginous; hind tibial scopæ long and black behind, white in front; hind tarsi with hair black behind, white in front, and bright ferruginous on inner side; first two abdominal segments without hair-bands or stripes, first segment at sides thinly clothed with dull white hair; third and fourth segments with thin white bands; apex with black hair, but at sides in subapical region is a long fringe of silvery white hair projecting from beneath.

St. Vincent, West Indies (*H. H. Smith*, 208), U.S. Nat. Museum. Ashmead, reporting on H. H. Smith's St. Vincent collections, records only *E. rufitarsis* and *E. pubescens*.

This is not particularly close to either, but is related to the Brazilian *E. nigripes*, Friese, which has the abdomen differently marked and the pleura dark-haired.

Melissodes martinicensis, sp. n.

♂.—Length about 9.5 mm., antennæ about 7.4 mm.

Very close to *M. rufodentata*, Sm., St. Vincent, but somewhat larger, with the subapical hair-bands on abdominal segments 2 to 4 clear white, and the hair of thorax above paler, not so red. The clypeus and base of mandibles are yellow, the labrum nearly white; flagellum ferruginous beneath to base; knees, tibiae, and tarsi clear ferruginous.

Martinique, West Indies, July 15 (*A. Busck*). U.S. Nat. Museum.

This could be regarded as an insular race of *M. rufodentata*.

Ptilothrix tricolor (Friese).

Carcarana, Argentina (*Bruner*, 57).

The original description by Friese is very inadequate, but Brethes gives an excellent one. *Ptilothrix* has in general the structure of *Diadusi*; but on comparison with the type of that genus (*D. enavata*) it differs markedly in the venation, the second s.m. receiving the first r. n. near middle, and

the third s.m. being much shorter. The mouth-parts are those of *Diadasia*, and *P. tricolor*, like our North American species of *Diadasia*, visits flowers of Cactaceæ. The venational character holds well enough when we compare North American *Diadasia* with typical *Ptilothrix*, but the Brazilian *P. murihirta*, Ckll., is intermediate, having the third s.m. as in *Ptilothrix*. *D. sumichrasti murihirta*, Ckll., also has a short submarginal. *Ptilothrix* agrees with the North American genus *Euphor*, to which it is closely related, in lacking a pulvillus on the feet. On this basis, as well as the short submarginal cell, *Diadasia sumichrasti*, Cresson, becomes *Ptilothrix sumichrasti*. *D. murihirta*, on the other hand, has large pulvilli, and remains in *Diadasia*.

Thus the separation of *Diadasia* from *Ptilothrix* may be maintained, though the genera are extremely closely allied.

It remains to consider the status of *Ancyloscelis*, which has been often used for these insects, and of *Melitoma*, which is preferred by Ducke. It is now considered that *Melitoma* is the prior name for *Eutechnia*, Patton, which I regard as a very distinct genus. *Ancyloscelis*, Latr., 1825, included no named species, and *Ancyloscelis*, Spinola, 1851, is a synonym of *Tetrapedia*. In 1836, however, Haliday published *Ancylosceles* (not *Ancyloscelis*) for a species *ursinus*, taken by Lieut. Graves at S. Paulo, Brazil. The specimen is probably in the W. W. Saunders collection at Oxford. It was a male, $4\frac{1}{2}$ lines long, with the region of the mouth, the tegulæ, and tarsi yellowish ferruginous. The description might serve for the recognition of the species, but the generic characters are not mentioned. So far as I know the insect has not been collected since, and at present we can only say that it is probably not a *Ptilothrix* or *Diadasia*. In *P. tricolor* (Fr.) there is long hair on the apical half of second joint of maxillary palpus, and all along the side of the third, while the fourth has shorter hair at side. The joints of the palpus measure in microns: (1) 320, (2) 480, (3) 512, (4) 352, (5) 224, (6) 176. The paraglossæ fall about 480 microns short of end of first joint of labial palpi. The hind spur is curved at end.

Diadasia australis knabiana, subsp. n.

♀.—Labrum, mandibles, and broad apical margin of clypeus bright chestnut-red; legs red, the femora dusky; apical bands on abdominal segments 2-4 very well defined.

Tehuantepec, Oaxaca, June 30 (*F. Knab*). U.S. Nat. Museum.

XXXIV.—*New Species and Forms of Sphingidæ.*
By J. J. JOICEY, F.E.S., and W. J. KAYE, F.E.S.

THE eight new species of Sphingidæ here described will be figured after the war. *Xylophanes sublævis* is a very old specimen acquired from a collection made about the year 1844, but it appears to be undescribed, and if so it would seem to be a very rare insect. *Hippotion rubribrenna* no doubt exists in several collections, there are a number at Tring Museum; but to us it has a distinct appearance, which is also easily definable. It was unfortunate to have had an accident with the genital preparation, but those who have specimens will be able to verify our contention by examining the male organs. *Marumba irata* is a striking novelty from Tibet, a district from whence many interesting things are now being sent. *Oxyambulyx citrona* adds still another to the already long list of closely allied *Oxyambulyx* species. The male clasp is different from both *O. schauffelbergeri* and *O. sericeipennis*, while in general appearance it is different from *O. sericeipennis* in many minor points, but not at all like *O. schauffelbergeri*.

Oligographa mosambiquensis, sp. n.

Fore wing various shades of brown, not grey as in *O. juniperi* and also narrower. Darkest at base, with dark lines along upper and lower edge of cell. A number of dark streaks on or between the veins. An apical wavy line from apex for a short distance as in *juniperi*. Discoidal spot large, white (much larger than in *juniperi*). Hind wing dark brown, unicolorous. Abdomen dull brown, with a faint central line. Wings below pale greyish brown. Underside of abdomen whitish.

Hab. S.E. Africa, Delagoa Bay.

Type in Coll. Joicey.

Marumba irata, sp. n.

Fore wing with the ground-colour violet-pink. The small basal area dark brown. Across the centre of cell is a bunch of four transverse lines the outer two of which are greatly curved and parallel. Small discoidal spot black. Beyond

the cell is a group of three transverse lines very close together, followed at a short distance by a very wavy line. Beyond this is a parallel wavy line that ends near tornus in a large chocolate-coloured spot; below this still nearer to tornus is a squarish similarly coloured spot. Hind wing pink, brownish towards outer margin. At tornus a double chocolate-coloured spot. Cilia white, brown only at the veins.

Underside of fore wing pink in basal half. Beyond cell a pair of indistinct transverse lines, followed later by a dark heavy line, and beyond is a complete but thin line from costa to inner margin. Brick-red elongate patches on veins 6 and 7 at margin. Smaller red marks on veins 4 and 5 and at tornus a large conspicuous red area sharply cut off by the subterminal line. Hind wing below violet-pink. A double dark line from costa recurving beyond middle to tornus. A very indistinct intermediate line between this and the next single heavy line. A further subterminal line enclosing a dark pinkish-grey marginal area, and a large red area at tornus. All the lines end at tornus and are not parallel to one another as in *M. complacens*.

Hab. Tibet.

Type in Coll. Joicey.

Xylophanes sublævis, sp. n.

Fore wing dull vinaceous reddish. An indistinct diagonal reddish line from apex to near the middle of inner margin, and a large reddish area between veins 4 and 6 just beyond the end of the cell. Hind wing black, a pale greyish area in centre of costal area and a large pale area near anal angle. A narrow pale marginal band irrorated with black from apex merging in the large pale area near anal angle. Thorax and abdomen pale reddish, the former with white stripes at the sides from behind the eyes to end of patagia. Second segment of abdomen with square black spots at sides. Underside of fore wing in the basal half black; costa reddish. Inner margin pale fawn-colour. Discoidal spot large, conspicuous, pale. Marginal half of wing pale reddish, with an indication of diagonal line from apex. Underside of hind wing unicolorous pale reddish.

Hab. "Brazil"; no more precise locality.

Ex Coll. Smith, 1844-5.

Hippotion rubribrenna, sp. n.

Fore wing reddish brown, paler than in *H. brennus*. A broad dark chestnut-brown transverse line from costa to inner margin, greatly elbowed at vein 5, where a similarly coloured discoidal blotch is extended outwards uniting with the transverse line. Three more or less broken paler lines at equal distances across the cell-area. Beyond the heavy transverse line is a paler line, followed by another dark line which is considerably sinuous in its lower half. Between these lines the ground-colour is pinkish. A large dark apical shade merging with the last dark transverse line. Subterminal line composed of small crescents. Hind wing bright brick-red (of a different shade to *brennus*) with a blackish marginal band which is broadest at apex. Sometimes at tornus of fore wing there is a patch of colouring of the same colour as the hind wing. Thorax very dark chestnut-brown with white margins and a white mesial patch just behind the head. Fore wing below bright brick-red with a broad pale purplish marginal band, much the broadest at vein 5, where it is extended inwards as a streak as far as the lower discocellular. A well-marked transverse line beyond the cell and a second line at a distance of about 3 mm., parallel, but becoming very faint at inner margin. Between these two lines is a fragmentary line nearer the second. Hind wing below similar to fore wing, but with two complete transverse curved lines and the marginal area not extended inwards as in fore wing.

Hab. Dutch New Guinea, Central Arfak Mts., 3500 ft., Nov. 1908 to Jan. 1909.

Type in Coll. Joicey.

Genitalia not markedly different from *H. brennus*, but decidedly smaller. The one preparation made was damaged in the mounting, but the clasp appeared to be the same.

Cechenena sumatrensis, sp. n.

Fore wing dull greyish brown, with an oblique black transverse line beyond the cell. A second line parallel from tip to inner margin, and two further less distinct lines ending in apex but radiating out towards tornus. A black mark at base. Beneath, black in basal half; reddish irrorated with small black spots in the distal area. Outer margin greyish brown terminated by an oblique blackish line as far as vein 4, where it is set back and continued thence to tornus. Hind wing above black, paler at the margins and with a yellow

patch becoming pointed distally at anal angle. Below pale reddish finely irrorated with small black specks. Abdomen beneath pale fawn-colour.

Hab. Sumatra, Langkat.

Type in Coll. Joicey.

Polyptychus olivolinea, sp. n.

Fore wing various shades of olive-brown. A broad dark olive-coloured transverse band narrowest at centre across discoidal cell, preceded basally by two parallel thin elbowed lines. A dark trapezoidal-shaped olive shade in centre of inner margin extending up as far as vein 4. Outer marginal area pale greyish olive, bounded between veins 4 and 6 by a dark olive, short, curved line. Dark points on veins 2, 3, and 4 near margin. Apex dark yellowish olive. Below, blackish grey, not greenish except just before pale grey margin and at apex. Pale marginal band from tornus to vein 4, thence it curves away from margin to vein 6, returning again to margin below apex. Hind wing blackish brown, with a dark mark at anal angle and dark marks on cilia at veins 2, 3. Underside yellowish olive, the base greyish olive. First line curved passing across end of cell. Second line very indistinct. Third line very much elbowed at veins 4-6, returning close to line 1. Lines 4 and 5 close together and parallel, both marked on the veins with short black lines. Anal angle blackish.

Nearest to *P. pygarga*.

Hab. Cameroons, Bitje, Ja River, 2000 ft., Oct.-Nov. 1913, wet season.

Type in Coll. Joicey. 1 ♀.

Oxyambulyx cyclasticta, sp. n.

Fore wing reddish-ochre. A small dark spot at base; a squarish olive-coloured spot on costa, and below it beyond the cell is a large circular olive spot with a pale ring; a pair of elbowed transverse lines slightly wider apart at costa than at inner margin, the first passing through the cell and almost touching the discocellular, the second well beyond the cell. Between veins 2, 3 close to the outer transverse line is a dull-coloured rather inconspicuous round spot. A dark marginal shade ending at apex and before tornus in a point. Between this shade and outer transverse line ground-colour darker,

with faint indications of two crenulated transverse lines and a rudimentary third line before apex. Hind wing ochreous, with a straight oblique line just beyond cell and a greatly curved and indented line between this and the outer margin. Outer margin crenulated, with white cilia between the veins. Thorax reddish ochreous with dark reddish-olive sides.

Fore wing below with dark spot between veins 2, 3 conspicuous, ground-colour reddish fawn. Outer area, especially in apical portion, heavily marked with reddish freckling. Hind wing below reddish ochreous, with first line well defined, second curved line merged in the general reddish freckling towards costa.

Hab. Burmah.

Type in Coll. Joicey.

Oxyambulyx citrona, sp. n.

Nearest to *O. sericeipennis*, and differs in the male clasp by having a short terminal hook in place of a long finger-like hook. Upper edge toothed as in *sericeipennis*, but finer and no high projection before the terminal hook. The whole clasp broader. The species stands between *O. sericeipennis* and *O. schauffelbergi*.



Fore wing paler than *O. sericeipennis* or *O. schauffelbergi*, and with a small spot at base and a similar spot only very slightly larger at a short distance from base. Ground-colour of wing pale fawn, with distal third darker. A wavy line across the cell and sometimes duplicated. Discoidal dot rather distinct. Four short black lines at tornus. Abdomen unicolorous pale fawn, with a faint middle line. Hind wing pale yellow, with oblique dark line across end of cell. A dark marginal band and a wavy irrorated indistinct inner line. A rather conspicuous black patch just before apex.

Hab. N. India, Sabatoo.

Type in Coll. Joicey.

XXXV.—*Notes on Agoutis, with Descriptions of new Forms.*
By OLDFIELD THOMAS.

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IN his list of duplicates for sale * Lichtenstein described, in 1823, an agouti as follows:—"Dasyprocta Azaræ n. Acouti Azar. Differt a Cav. Aguti Auct. potissimum tergo concolore, pilis basi albis vestito. E provincia San. Paulo Brasil. . . . E. (i. e. specimen eximium) Thlr. 7."

He here describes a specimen with a definite locality—São Paulo,—and it is clear that the name must be applied to the species of that locality, with his specimen as type, whether the "Acouti" of Azara is or is not of the same species.

In 1841, however, Lund †, finding that the Lagoa Santa agouti was larger than the Paraguayan, with a longer tail, described the former as new under the name of *D. caudata*, and applied the name *D. azaræ* to the latter.

This allocation of names has been followed by Waterhouse and other authors to the present time, though the distinction of the two forms has not been generally recognized.

Now, however, I find that the two species are undoubtedly distinct, and since the name *D. azaræ* must certainly be applied to the São Paulo animal, with *D. caudata* as a synonym, the Paraguayan one is left without a name.

It may be called

Dasyprocta felicia, sp. n.

Size decidedly less than in *D. azaræ*. Colour on the whole as in that animal, but the yellow of the fore-back and flanks is paler and greyer, so that there is less contrast between these parts and the greyish rump. Under surface with a distinct mesial line of yellow or white running from chest to inguinal region. Tail shorter than in *azaræ*, little more than $\frac{1}{2}$ inch in length.

Skull conspicuously smaller than that of *D. azaræ*.

Dimensions of the type (measured on skin):—

Head and body 490 mm.; tail 15; hind foot 100; ear 84.

Skull: greatest length 102; condylo-incisive length 86.4;

* Verz. Doubl. p. 3 (1823).

† K. Dansk. Vid. Selsk. viii. p. 287 (1841).

zygomatic breadth 48·5; nasals 35·6; interorbital breadth 29·4; palatilar length 40; upper tooth-series 17·7.

Hab. Paraguay. Type from near Concepcion.

Type. Old female. B.M. no. 98. 7. 3. 7. Collected by Mr. T. Insley. Presented by Oldfield Thomas. Five specimens examined.

The specific term is suggested by Don Felix d'Azara's Christian name.

Cope's *D. aurea* from Chapada, Mattó Grosso, stated by Allen to be founded on an albino, is, as indicated by some specimens from that place in the British Museum, barely distinguishable subspecifically from *D. azaræ*.

The British Museum has possessed for many years an undetermined agouti from Santa Catherina—a locality further south than any place from which a *Dasyprocta* has been recorded. This specimen appears to represent a new subspecies of its nearest geographical neighbour *D. azaræ*, and may be called

Dasyprocta azaræ catrinæ, subsp. n.

General colour paler and greyer than in true *azaræ* of São Paulo, the fore-back and sides scarcely tinged at all with yellow; the rump also yellowish, not hoary grey as is usual in *azaræ*. But the most marked character is that the long hairs of the rump, instead of being ringed with brown and whitish to the base, are straw-yellow for the greater part of their length, an inconspicuous brown ring quite close to the base and one or two others near the tip alone interrupting the yellowish colour, which is unbroken for some 40–70 mm. on the longer hairs. Under surface grizzled greyish laterally, yellowish white mesially. Feet grizzled black and yellow, darker terminally, as in *azaræ*.

Skull of type, immature (p^1 just changing): greatest length 102 mm.; condylo-incisive length 87; upper tooth-row 18·8.

Hab. Santa Catherina, S. Brazil.

Type. Immature male. B.M. no. 46. 6. 1. 29. Purchased of Parzudaki.

The nearest locality to Santa Catherina from which we have *D. azaræ* is Roça Nova, Parana, where M. Robert collected a series. His specimens, however, show no approach to the peculiar coloration of *D. a. catrinæ*.

Dasyprocta variegata boliviae, subsp. n.

Most nearly allied to *D. v. yungarum*, but conspicuously lighter in colour. General colour of fore-back, when seen from a distance, near "buckthorn-brown" of Ridgway, the hairs ringed with black and ochraceous. Long hairs of rump black, with narrow ochraceous tips, which soon wear off, leaving the hairs wholly black. Middle line of under surface vivid ochraceous, not so sharply defined laterally as in *yungarum*. Upper surface of hands and feet like body, grizzled ochraceous and black, not wholly black as in other members of the *variegata* group.

Dimensions of the type:—

Hind foot 104 mm.

Skull: zygomatic breadth 53; nasals 41.3; palatilar length 43; upper tooth-series 19.5.

Hab. Southern Bolivia. Type from Yacuiba, on the Argentine boundary south of Caiza. Other specimens from Santa Cruz de la Sierra and its neighbourhood.

Type. Old female. B.M. no. 7. 8. 2. 22. Original number 26. Collected 15th August, 1905, by J. Steinbach. Presented by Oldfield Thomas.

The agoutis from Southern Bolivia are readily distinguishable by their generally light colour and their grizzled ochraceous feet, all those from Peru and north-westwards having black feet.

Among the specimens I refer to this form are some at least of those from Santa Cruz de la Sierra, collected by Bridges and determined by Waterhouse as *D. azarae*. One of them is quite like the Yacuiba specimen, while another has less black hairs on the rump. But owing to the histories and individual localities of Bridges's specimens not having been preserved, it is difficult to know quite what this variation means.

One specimen also from Charuplaya, Bolivia, collected by P. O. Simons, has the general colour and light feet of this form, while another from the same place is closely similar to true *yungarum*, so that that would appear to be about the region where the two forms pass into one another.

Allen's *D. v. urucuma** from Corumbá, Matto Grosso, further to the east, appears to be darker and has the "hind feet deep black" as in ordinary *D. variegata*.

* Bull. Am. Mus. xxxiv. p. 634 (1915).

Nearly seventy years ago an agouti was collected on Gorgona Island, off the west coast of Colombia, by Capt. Kellett and Lieut. Wood, during the cruise of H.M.S. 'Pandora.' The specimen was registered as "*Dasyprocta aguti*," and, being immature and not in good condition, has not hitherto been re-examined.

Now, however, on comparison with skulls of similar age of the allied species I find that it is so much smaller as to deserve specific distinction.

Dasyprocta pandora, sp. n.

General colour-characters of *D. variegata*, but size much smaller.

Fore-back and sides grizzled yellow and black, the yellow more prominent on the middle back; lengthened rump-hairs black, with yellowish tips. Feet black, with a few fine yellow hairs intermixed.

Dimensions of the type:—

Hind foot (dry) 90 mm.

Skull: greatest length 89; zygomatic breadth 42.5; nasals 31; palatilar length 23.5; combined length of mp^4 , m^1 , and m^2 13.2; mp^4 , length 4.9, breadth 4.

Hab. Island of Gorgona.

Type. Immature male. B.M. no. 50.1.26.29. Collected and presented by Capt. Kellett and Lieut. Wood, of H.M.S. 'Pandora.'

No doubt this is a diminished insular representative of *D. variegata*. Its reduction in size is shown by the fact that skulls of that animal of about the same age are upwards of 105 mm. in length, while the three teeth above measured may together be 15 mm. in length, mp^4 being 5.6×4.3 , and the other teeth also conspicuously more bulky.

That this animal is a genuine native of Gorgona, about which I had always had a doubt, has been proved by Mr. Bangs, who, in 1908, included a specimen of it in his list of the mammals of the island*. His specimen was also young—too young for certain determination,—and he only provisionally referred it to *D. variegata*.

The other two land-mammals obtained by him—*Cebus curtus* and *Proechimys gorgonæ*—were both described as new.

* Bull. Mus. Harvard, xlv. p. 89.

XXXVI.—*A new Heliophobius from North-eastern Rhodesia.* By OLDFIELD THOMAS.

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A RE-EXAMINATION of the mole-rats obtained in the Loangwa Valley and Angoni-land by Mr. S. A. Neave, and referred to *Heliophobius argenteo-cinereus* by Mr. Wroughton, convinces me that the species should be distinguished from the Nyasa form. It may be called

Heliophobius angonicus, sp. n.

Colour and length of fur about as in the Nyasa species. A small white frontal spot present in two specimens out of four.

Skull distinguished from that of *argenteo-cinereus* by its much greater frontal breadth, and the greater development of the postorbital processes, the orbital concavity in front of them being consequently much more marked. Upper profile about as in *argenteo-cinereus*, though the occipital plane is more slanted forwards; a distinct vertical ridge developed in the middle line in all three adult specimens—not present in any of our considerable series of the allied species. Structure of posterior palate as in *argenteo-cinereus*, not as in *spalax*.

Dimensions of the type:—

Head and body 154 mm.; tail 16; hind foot 30.

Skull: condylo-basal length 40.5; condyles to tip of incisors 44.2; zygomatic breadth 32; nasals, length 13, breadth anteriorly 3.3, at posterior third 5.2; interorbital breadth 9.4; tip to tip of postorbital processes 12.4; intertemporal breadth 9.4; least breadth above meatus 18; mastoid breadth 21.3; palatilar length 23; upper tooth-series (alveoli) 8.2.

Hab. East Loangwa Valley and Angoni-land. Type from the Bua River, Central Angoni-land. Alt. 3500 ft. Other specimens from Petanke 2400 ft., the Mkala Country 2600 ft. (Neave), and West Nyasa at 12° S., 34° E. (Lloyd).

Type. Adult male. B.M. no. 10.9.21.10. Original number 211. Collected 31 May, 1910, by S. A. Neave. Presented by the Entomological Research Committee.

This species is chiefly distinguished from *H. argenteo-cinereus* by the greater development of the postorbital projections, the greatest breadth across these in a full-grown specimen of that species being only 9·6, with interorbital breadth 9, as compared with the 12·4, 9·4 of *angonicus*, these measurements being approximately constant throughout the series of both forms. The little vertical ridge on the occipital plane is present in all three adult specimens of *angonicus*, and in none of the eight available examples of *argenteo-cinereus*.

Of other species, *robustus* of Mpika is much larger, *marungensis*, Noack, of Marungu, is separated geographically by the locality of *robustus*, and has its frontal profile more as in the East African *pallidus*.

XXXVII.—*The Spalax of the Grecian Archipelago.*

By OLDFIELD THOMAS.

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THE National Museum owes to Major T. S. Blackwell, R.A.M.C., now serving his country in the Island of Lemnos, a series of six skulls, three male and three female, of the mole-rat (*Spalax*) of that island, obtained at Mudros West, where these "moles" are said to be very numerous. Besides these excellent skulls, the Museum also contains a skin and imperfect skull sent in 1916 from Mudros East by Capt. H. M. Warrant, to whom we owe our first knowledge of the occurrence of *Spalax* in the island.

On reference to Mehely's elaborate Monograph of the genus, the Lemnos *Spalax* would appear to be referable to the widely distributed *Spalax* (*Mesospalax*) *monticola*, but cannot be identified with any one of the eleven subspecies of that animal which he recognizes, and forms a special race, which may be called

Spalax monticola insularis, subsp. n.

Incisors generally white in front. Molars with coalesced roots, about as in *S. m. anatolicus*. Nasals reaching about as far back as the premaxillary processes, their junction with the frontals unusually complicated.

Size about as in *S. m. hellenicus*, larger than in *anatolicus*.

Compared with *anatolicus*, the skull is of about the same general shape, though distinctly larger. Muzzle and nasals of similar outlines, but the posterior boundary of the premaxillary processes and of the nasals quite unusually complicated, the interdigitation with the frontals carried to an extreme, so that it is impossible exactly to define the limits of each bone—but the middle of the junction is about opposite the hinder edge of the anteorbital foramina. This complication of the sutures is quite unequaled in other members of the genus, and is to a lesser extent repeated along the premaxillo-maxillary suture, the close-set interdigitations often nearly equal in length to the palatal foramina. The course of the two sutures (naso-frontal and premaxillo-frontal) not directly transverse as in *dolbrugeæ*, but bending backwards in the centre, as in *anatolicus*, with a large naso-basal process on each side. Profile-line from lambda to tip of nasals bowed, about as in *dolbrugeæ*, not so straight as in *anatolicus*.

Incisors averaging far lighter coloured than in other forms, those of the lower jaw always dead white, and in the majority of the specimens those of the upper jaw also white, one only out of the seven distinctly yellow (though still pale yellow) and two more with a faint yellowish tinge. In other forms it is rare to find specimens with the upper pair not distinctly yellow. No doubt this is an unsatisfactory character owing to its variability, and Mehely has not used it at all, but the average difference between the Lemnos and other forms is so decided as to make it worthy of mention.

Molars with their roots coalesced, about as in *anatolicus*, and therein different from those of *hellenicus*, of which it is said "an *m'* und *m''* alle drei Wurzeln frei; die Alveolen dieser Zähne dreiwbig."

Dimensions of male and female skulls, both old, the first the type:—

Greatest (condylo-nasal) length 51, 48·2 mm.; condylo-incisive length 47·5, 45; zygomatic breadth 38, 34; height 17·8, 16·4; nasals, length 22, 20·5; tip of nasals to lambda 40·5, 38·2; distance between anteorbital foramina 8·4, 8; henselion to back of palatal foramina 11·5, 10·6; back of palatal foramina to palation 15, 14·3; upper molar series (crowns) 7·8, 7·1; (alveoli) 8·2, 8·1.

Hab. Island of Lemnos. Type from Mudros West.

Type. Old male. B.M. no. 17. 8. 15. 3. Original number 6. Collected 6 April, 1917, and presented by Major T. S. Blackwell, R.A.M.C.

This island mole-rat differs from *S. m. hellenicus*, of the Grecian mainland, by the coalesced roots of the molars, from *S. m. anatolicus*, of Smyrna, of which we have a certain number presented by Mr. Griffith Blackler, by its larger size and the greater complication of the sutures along the front edge of the frontals, and from both by its incisors being nearly constantly white instead of yellow.

I may note here that the young *Spalax* from Styliis, Phthiotis, Greece, mentioned by Miller under *S. græcus*, proves, on examination of its molar roots, to be referable to *S. monticola hellenicus*.

XXXVIII.—On a new Species of Shrew from Corea.

By ARTHUR DE CARLE SOWERBY, F.Z.S., F.R.G.S.

IN the summer of 1913, while camped on the Upper Sungari in Central Manchuria, I secured specimens of shrews that have been referred by Mr. Gerrit S. Miller, Jr., of the U.S. National Museum, to Dobson's *Crocidura lasiura* from the Ussuri.

Later, in 1915, while on the Lower Sungari, near its junction with the Amur, I secured another specimen which has also been referred to that species.

The measurements in the flesh of these specimens are as follows:—

	Head and body.	Tail.	Hind foot.
	mm.	mm.	mm.
♂.....	104	48	16·5
♂.....	88	41	16
♂.....	86	44	16
♂.....	85	44	16·5
♀.....	80	42	15·9

In 1905 Mr. Malcolm P. Anderson secured a large series of shrews in Corea, which Mr. Oldfield Thomas referred to

Crocidura lasiura (P. Z. S. 1906, p. 860), of four specimens of which he gives the following measurements:—

“Four adult specimens from Min-gyong measure:

	Head and body. mm.	Tail. mm.	Hind foot. mm.
♂	83	40	15
♂	79	40	15
♀	76	38	14
♀	73	35	13·5

In comparing these two sets of measurements it will at once be seen that there is a very considerable difference in the sizes of the Corean and Manchurian shrews, and, since my specimens undoubtedly belong to Dobson's *Crocidura lasiura*, it would seem that Mr. Anderson's Corean specimens represent an unnamed species. After corresponding with Mr. Thomas on the subject, and finding that he agrees with me in the matter, I have decided to separate the Corean form, and since Mr. Thomas has done so much in working out the mammals of Eastern Asia, particularly in the Insectivores, I would propose to name this species in his honour

Crocidura thomasi, sp. n.

This shrew may be described as closely resembling *C. lasiura* in colour and general appearance, but differing markedly in point of size, being very much smaller.

The only fully adult specimen of *C. lasiura* taken by me in Manchuria has a head and body measurement of 104 mm., tail 48, hind foot 16·5, as compared with 83 mm., 40, and 15 in the largest of the Corean specimens.

Proportionately, also, the tail in *C. thomasi* is shorter than in *C. lasiura*.

Colour. Mr. Thomas says the Corean specimens agree fairly well with Dobson's description, so we may presume that the colour is about the same, though I have not been able to compare specimens. *C. lasiura* is of a very dark blackish slate, only very slightly lighter on the under surface*.

Dimensions of type (measured in the flesh):—

Head and body 83 mm.; tail 40; hind foot 15; ear 9·5.

* [*C. thomasi* is paler than the above would suggest, the type scarcely darker and greyer above than Ridgway's "diab," neutral grey below.—O. T.]

Skull: extreme length from condylion to front face of incisors 22·8; basal length 20·2; greatest posterior breadth 10; interorbital breadth 4·6.

Type. Adult male. B.M. no. 6. 12. 6. 16. Original number 659. Collected at Min-gyong, 110 miles S.E. of Seoul, Corea, 25 November, 1905, by Malcolm P. Anderson. Presented by the Duke of Bedford, K.G.

It is to be noted that Dobson stated his type to be an immature female, which accounts for the comparatively small dimensions he gives.

XXXIX.—*The Homoptera of Indo-China.*

By W. L. DISTANT.

Fam. Cicadidæ.

IN a previous paper on this subject (*ante*, (8) xix. p. 100), I gave a rough list of fifty-five species belonging to this family alone. Since then a further collection from Mon. R. Vitalis de Salvaza has arrived at the British Museum. Those to be added to the previous list are as follows, including ten species here described for the first time:—

Tosena splendidula, Dist.
Cryptotympana mimica, Dist.
 — *vitalisi*, Dist.
Dumubia longina, Dist.
Cosmopsaltria divergens, Dist.
Haphsa conformis, Dist.
 — *fratercula*, Dist.
 — *opercularis*, Dist.
 — *crassa*, Dist.

Platylomia diana, Dist.
 — *saturata*, Walk.
Meimma tripurasura, Dist.
Terpnosia majuscula, Dist.
Gæana luosensis, Dist.
 — *vestita*, Dist. var.
Mogannia funebris, Walk.
Huechyys aurantiaca, Dist.
Scieroptera delineata, Dist.

These 18 species + 55 previously recorded — 1 suppressed in this contribution bring the total to 72 species of Cicadidæ now known from Indo-China.

Cryptotympana mimica, sp. n.

♂. In colour and markings very closely resembling *C. pusillata*, Fabr., but the abdomen beneath being ochraceous with a broad central longitudinal black fascia; opercula black, their outer and apical margins narrowly

ochraceous. In structure, however, the male strongly differs in the length and shape of the opercula. In *C. pustulata* the opercula are not half the length of the abdomen and their inner margins strongly oblique to apices; in the species here described the opercula are considerably longer than half the abdominal length, their inner margins concave, their outer margins a little sinuate and their apices subacute, in *C. pustulata* the apices are obtusely rounded.

Long., excl. tegm., ♂, 41 mm.; exp. tegm. 113 mm.

Hab. Laos; Vietri (*R. Vitalis de Salvaza*).

Cryptotympana vitalisi, sp. n.

♂. Body and legs black; ocelli and transverse fringe of hairs before them, two macular patches of hairs on each lateral area of pronotum, pilose spots to metanotum (two on anterior margin, two on each lateral margin, and two in front and one at each lateral margin of cruciform elevation) ochraceous; small spots at lateral abdominal segmental margins and a larger spot on each side of anal segment ochraceous; lateral and apical areas of face reddish ochraceous; lateral margins of opercula ochraceous; tegmina black to near middle and more or less illuminated with dull ochraceous, remaining costal and the apical areas pale fuliginous, the lower three ulnar areas more or less pale hyaline; wings black illuminated with dull ochraceous for more than basal half, remaining area pale hyaline; face globose, deeply centrally sulcate on disk and strongly transversely striate; opercula with their apical halves broadly angulate, slightly inwardly overlapping on basal areas, their apices reaching to about the third abdominal segment at its lateral areas; pronotum with the fissures prominent, its posterior marginal area strongly transversely striate.

Long., excl. tegm., ♂, 48 mm.; exp. tegm. 128 mm.

Hab. Laos; Vietri; Cochin China; Cap Saint Jacques (*R. Vitalis de Salvaza*).

Allied to *C. aquila*, Walk.

Dundubia longina, sp. n.

♂. Head and pronotum pale brownish ochraceous; a spot at apex and a suffusion at base of front, a central

longitudinal fascia and posterior and lateral areas of pronotum olivaceous, the extreme posterior and lateral margins narrowly black; abdomen above olivaceous, somewhat thickly greyishly pilose; body beneath and legs paler olivaceous or ochraceous, apices of anterior femora, the anterior tibiae and tarsi, longitudinal streaks to intermediate femora and tibiae, and the whole of the intermediate tarsi black; tegmina and wings hyaline, the venation olivaceous or ochraceous; opercula long, slightly passing the last abdominal segment but not reaching the apex of the anal segment, concavely sinuate on each side of basal half and then moderately broadened and convex on each side, the apices rounded; face strongly transversely striate, moderately broadly centrally sulcate; posterior pronotal area thickly, transversely striate; mesonotum with two central, faintly marginally indicated obconical spots; abdomen robust, broadly convex, about as long as space between apex of head and base of cruciform elevation.

Long., excl. tegm., 42 mm.; exp. tegm. 120 mm.

Hab. Tonkin (*R. Vitalis de Salvaza*).

Allied to *D. mannifera*, Linn., but a more robust species, with the opercula longer, slightly passing the last abdominal segment; thickly pilose abdomen etc.

Cosmopsaltria divergens, sp. n.

♂. Head above ochraceous, front with a large black spot on each lateral area, vertex with an irregular transverse fascia and the margin of the ocelli and a streak behind inner margin of each eye black; pronotum ochraceous, its posterior and lateral areas paler, the fissures and two central longitudinal angulated fasciae which are angularly united posteriorly, black; mesonotum ochraceous, a broad elongate fascia on each lateral area, two central obconical spots divided by a long lanceolate spot and a spot at each anterior angle of the cruciform elevation black; abdomen castaneous, the narrow segmental fissures black; body beneath ochraceous, face with the lateral striations and a central fascia on posterior half, costal spots, streaks to femora, anterior tibiae and tarsi, bases and apices of intermediate and posterior tibiae, margins of opercula, and abdomen beneath, more or less black; tegmina and wings hyaline, venation ochraceous, tegmina with the upper margin of basal cell and basal half of inner claval margin, and wings

with the veins to upper ulnar areas and to claval area black; tegmina with the transverse veins at bases of second and third ulnar areas infuscated.

Opercula in ♂ reaching the penultimate abdominal segment, their inner margins convex and distinctly overlapping, their apical margins somewhat roundly oblique, their lateral margins concave near base; face broad and tumid, centrally sulcate on posterior half, the lateral striations coarse and profound.

Long., excl. tegm., ♂, 34 mm.; exp. tegm. 100 mm.

Hab. Laos; Luang Piahang (*R. Vitalis de Salvaza*).

Above resembling the Indian species *C. duarum*, Walk., but differing from all other species of the genus with which I am acquainted by the peculiar structure of the opercula.

Haphsa conformis, sp. n.

♂. Head, pronotum, and mesonotum olivaceous green; front of head with an angulated central spot; vertex with the area of the ocelli and an angulated fascia before each eye black; pronotum with two central anteriorly and posteriorly angulated fasciae, the fissures, the anterior and posterior edges of the posterior and lateral marginal areas, and two spots on the latter black; mesonotum with a central longitudinal fascia which is angulated on each side before base, and on each side of this fascia a shorter obconical spot, followed by a broad sublateral fascia, excavate and broken near anterior margin, the anterior angles of the basal cruciform elevation and a spot in front of same black; abdomen above ochraceous, the central and apical areas more or less black; face and clypeus black, striations and a central longitudinal fascia (broken centrally), base and a central fascia to clypeus ochraceous; sternum, legs, and opercula more or less ochraceous, apices of tibiae and the tarsi black; abdomen beneath bright ochraceous; tegmina and wings hyaline, the venation either black or castaneous, costal membrane black, olivaceous green on its basal area, transverse veins at bases of second and third terminal apical areas darkly infuscated; opercula broad, their inner margins straightly adjacent but not meeting for about one-third from base, thence obliquely rounded to apices which are subangularly, obtusely rounded and reach the penultimate abdominal segment: face strongly convex; abdomen about

as long as space between apex of head and base of cruciform elevation.

Long., excl. tegm., ♂, 28 mm.; exp. tegm. 94 mm.

Hab. Tonkin (*R. Vitalis de Salvaza*).

Haphsa fratercula, sp. n.

♂. Body above pale castaneous brown; a central angulated spot to front, area of ocelli and a lateral curved fascia on each side of vertex; two central angulated lines and the fissures to pronotum, central longitudinal fasciæ to mesonotum, and basal areas of the abdominal segments black, lateral areas of the pronotum ochraceous; body beneath and legs more or less ochraceous; face with a central black fascia angularly extended on anterior and posterior areas, lateral areas of clypeus, apices of anterior femora, apical areas of tibiæ, tarsi, and apex of rostrum black; opercula ochraceous, conically narrowed to apices which reach the anterior margins of the fourth abdominal segment, their inner basal margins contiguous but not meeting; face convexly tumid; abdomen as long as space between the apex of head and base of cruciform elevation; tegmina and wings hyaline, venation mostly black, tegmina with the basal half of costal area castaneous, the transverse veins at the apices of the second and third apical areas infuscated.

Long., excl. tegm., 24 mm.; exp. tegm. 82 mm.

Hab. Xieng Klouang (*R. Vitalis de Salvaza*).

Allied to *H. nicomache*, Walk., found in British India.

Haphsa opercularis, sp. n.

♂. Generally allied in colour and markings to the preceding species, *H. fratercula*, but a larger species with a different structure of the opercula, which reach the fifth abdominal segment, are obliquely and angularly divergent from base to apex which is obtusely angulate.

Long., excl. tegm., ♂, 30 mm.; exp. tegm. 105 mm.

Hab. Xieng Klouang (*R. Vitalis de Salvaza*).

Terpnosia majuscula, sp. n.

♂. Head, pronotum, and scutellum pale castaneous; face, eyes, a central discal fascia to pronotum (centrally compressed), two large central obconical spots to mesonotum

and a larger spot on each lateral area (sometimes practically absent), and a rounded spot near each anterior angle of the basal cruciform elevation black; abdomen above pale castaneous with black shadings on basal and apical areas, beneath pale shining ochraceous, the apical area pale castaneous; sternum, opercula, and legs testaceous brown; tegmina and wings hyaline; the first with the costal area, venation, basal cell, suffusions to basal margins of first and second ulnar areas, broader suffusions to the apical margins of all the ulnar areas, and prominent spots to the apices of all the veins to apical areas testaceous brown; wings with broad suffusions at the apices of the upper ulnar areas, and narrow outer margin testaceous brown; face prominently transversely ridged on lateral areas; rostrum passing posterior coxæ, its apex black; opercula transverse, not extending beyond base of abdomen, outer margins convex; body above and beneath more or less sparingly ochraceously pilose.

Long., excl. tegm., ♀, 37-42 mm.; exp. tegm. 100-105 mm.

Hab. Laos; Chapa (*R. Vitalis de Salvaza*).

Allied to *T. psecus*, Walk., but a larger species, the opercula broader and more transverse, the wings with discal suffusions and margins testaceous brown.

Terpnosia mesonotalis.

Terpnosia mesonotalis, Dist. Ann. & Mag. Nat. Hist. (8) xix. p. 102 (1917).

Calcagninus salvazanus, Dist. l. c. p. 103.

The specimen I included in the genus *Calcagninus* (supra) was apparently tuberculous on the abdomen beneath; from a further and lengthy series this character is not to be maintained, and the species must be suppressed and placed as a synonym of *Terpnosia mesonotalis*.

Gæana laosensis, sp. n.

♀. Head, pronotum, and mesonotum black; a large spot on each lateral area of the pronotum, the abdomen, and legs more or less bronzy brown; two basal spots to head (one near each eye), a transverse series of four spots to mesonotum and two central spots at base of same, a spot on each side of face near eyes, coxal margins, and a double series of submarginal abdominal segmental spots ochraceous; tegmina pale tawny brown, a central transverse series of four

spots (the uppermost in radial area) and the apical one dark tawny brown, on the apical area about nine small greyish-white spots (six submarginal, the other three near the anterior confines of the dark apical area); wings pale blackish with greyish-white streaks at base and five small spots of the same hue near apical margin.

Structural characters reserved till ♂ specimen received.

Long., excl. tegm., ♀, 27 mm.; exp. tegm. 82 mm.

Hab. Laos; Tathom (*R. Vitalis de Salvaza*).

Allied to the British Indian species *G. stellata*, Walk.

Gæana vestita, var.

Gæana vestita, Dist. Entomologist, xxxviii. p. 121, fig. (1905).

♀. Differing from the typical form of ♂ in having the transverse subcentral pale fascia broken up into three spots, and with no pale spot in the penultimate ulnar area.

Hab. Laos; Tathom (*R. Vitalis de Salvaza*).

Scieroptera delineata, sp. n.

♀. Head black; pronotum dark castaneous, lateral and posterior margins and a central "hourglass"-shaped fascia dark ochraceous; mesonotum dark ochraceous, with a large, fasciate, obconical black spot on each lateral area, the basal cruciform elevation dark ochraceous; face black, its lateral areas, sternum, and legs more or less ochraceous; anterior femora with more than apical halves black, intermediate and posterior femora more or less apically suffused with black; abdomen beneath somewhat fuscous and opaque, above black; tegmina shining, talc-like, nearly basal half brassy brown, remaining area of a paler brassy hue, the costal membrane and costal area and the veins on about basal half testaceous brown, remaining venation more or less black, interior of basal cell and inner tegminal margin black; veins on basal half suffused with testaceous brown and a transverse macular fascia of the same colour delimiting the basal area; wings pale brassy yellow; face transversely striate, not longitudinally sulcate; anterior femora with three long robust spines on underside of anterior areas; rostrum reaching the intermediate coxæ; vertex of head at base and between the ocelli distinctly sulcate.

Long., excl. tegm., ♀, 18 mm.; exp. tegm. 50 mm.

Hab. Laos; Chapa (*R. Vitalis de Salvaza*).

BIBLIOGRAPHICAL NOTICE.

Of late years the British Museum of Natural History has displayed increasing activity in fostering and furthering the study of Economic Zoology, while no less zeal has been exerted in disseminating the knowledge accumulated by the researches of the professional zoologist, especially where this knowledge has a direct bearing on the health of the community.

This useful work is accomplished partly through the medium of the exhibition-galleries of the Museum, where these agents for the dissemination of disease, and sometimes the direct causes thereof, are displayed side by side with large models, and partly by means of illustrated guide-books which can be taken away and read at leisure.

A batch of these publications has just reached us, and they cover a wide range of subjects. Two are in the form of poster-leaflets—a new departure on the part of the Museum authorities. The “Fly Danger” and the “Mosquito Danger” are the themes chosen for this venture. Each bears a large figure of the adult insect, and sets forth, tersely, the diseases spread by their agency, the breeding-places of the insect, and how to destroy them. They are to be sold at the price of one halfpenny. We wish it could have been found possible to distribute them gratis.

In the more familiar pamphlet-form the Trustees have made available much indispensable information on “The Bed-bug,” “Species of Arachnida and Myriopoda Injurious to Man,” and the “Biology of Water-works,” all written by members of the staff and generously illustrated. In regard to the bed-bug, two species are described, and much valuable and useful information in regard to their life-history and preventive measures is given. But we venture to think that the section entitled “How it sucks the blood,” with the diagrams appertaining thereto, will be found quite unintelligible to the public. To describe this process in simple language is undoubtedly a difficult task, but it should not be insuperable. The description here offered appears to us to be useless.

The pamphlets on the Arachnida and the Biology of Waterworks are altogether admirable. A vast amount of information, not merely in regard to hygiene, but also in relation to the life-histories of the animals concerned, has been crowded into a surprisingly small space, and this in such an admirable manner that the interest aroused will do much to aid in the dissemination of the knowledge it is the aim of these pamphlets to spread.

PROCEEDINGS OF LEARNED SOCIETIES.

GEOLOGICAL SOCIETY.

June 20th, 1917.—Dr. Alfred Harker, F.R.S., President,
in the Chair.

The following communication was read:—

‘The Inferior Oolite and Contiguous Deposits of the Crewkerne District (Somerset).’ By Linsdall Richardson, F.R.S.E., F.G.S.

In this communication a detailed description is given of the Inferior Oolite of the Crewkerne District.

Roughly speaking, the Upper Liassic Sands to the south-west of a line connecting South Petherton, Crewkerne, and South Perrott, are very similar to their equivalents in the Burton-Bradstock-Beamminster-Broadwindsor District. To the north-west of that line, however, limestones—largely made up of shell-débris—replace a considerable portion of the yellow sands of *moorei* hemera, ‘thickening’ from about 18 feet at North Perrott (‘Perrott Stone’) to 78 feet at Ham Hill (‘Riddings’ and Ham-Hill Building-Stone).

In the extreme south-western portion of this district, around say Drimpton, the *Aalensis* Beds are also probably very similar to their equivalents in the Burton-Bradstock-Beamminster-Broadwindsor District, and at Furzy Knaps, near Seavington St. Mary (4 miles north-west of Crewkerne), what is seen of them is highly fossiliferous. East of Crewkerne, however, these beds ‘attenuate’ and ‘die out’ altogether between North Perrott and Yeovil Junction.

The *Opaliniforme* Beds at Broadwindsor, Whaddon Hill, and Chideock-Quarry Hill comprise, in descending order,—

- (a) Rusty Bed;
- (b) Very fossiliferous sandstone; and
- (c) Sands and sandburrs.

The equivalent of (b) is readily recognized at the Cathole Lane Section, Crewkerne, where it is very rich in ammonites. Above it are deposits which are with but little doubt equivalent to the Rusty Bed of more southern localities. East of Crewkerne, the *Opaliniforme* Beds—like the *Aalensis* Beds—‘attenuate,’ the lower beds apparently disappearing first. They ‘die out’ between East Chinnock and Yeovil Junction.

The *Scissum* Beds are 6 feet 2 inches thick at Broadwindsor, and very fossiliferous. They retain the characters exhibited at Broadwindsor in the area south of the L. & S.W. Railway; but at North Perrott—on the north—what appears to be the equivalent of their lowest portion is softer and thicker. The *Scissum* Beds also fail between East Chincock and the Junction.

The *Scissum* Beds are succeeded by the *Ancolioceras* Beds—at the Conegar-Hill Section, Broadwindsor, two strata, each 1 foot thick. The *Ancolioceras* Beds extend into the Crewkerne district: they are well exposed at the Misterton Lime-Works and at other sections in the neighbourhood, and apparently were proved in the now filled-up quarry in Haselbury-Plucknett village. Probably the *Ancolioceras* Beds persist throughout the Crewkerne district.

The upper portion of the *Murchisonæ* Beds is the main horizon for *Zeilleria anglica* (Oppel). In the neighbourhood of Beaminster specimens of this brachiopod are very abundant. The true *Zeilleria-anglica* Beds are absent from the Conegar-Hill Section, but occur at Drimpton—in the extreme south of the Crewkerne district; and apparently were met with at Haselbury Plucknett—east of Crewkerne.

Attached here and there to the top of the *Murchisonæ-Ancolioceras* Beds is ironshot rock, doubtless of late *bradfordensis* date—the date of the *Rhynchonella-ringens* Beds of the Sherborne district. Thicker deposits may be present at Dinington and Haselbury Plucknett. Deposits of *concavi*, *discitæ*, and, in places, of *blagdeni* hemeræ may also be present in the neighbourhood of Dinington.

There is thus a great hiatus in the Inferior-Oolite Series of the Crewkerne district, there being—except possibly in the neighbourhood of Dinington—no rock present assignable to any hemera between those of *bradfordensis* and *garantianæ*—the latter the date of the wide-spreading Upper *Trigonia* Grit of the Cotteswolds.

The rock of *garantianæ* date varies considerably in lithic characters, thickness, and abundance of organic remains in the district.

It has not been possible to identify definitely the *Truellei* Bed in the district. The main of the Top Limestones is of *schlambachi* date. The *Schlambachi* Beds 'attenuate' east of Crewkerne; but at Haselbury-Mill Quarry, in what the Author regards as their lower portion, is a very interesting Sponge-Bed, similar in appearance to that exposed in the Peashill Quarry, Shipton Gorge (Dorset). This Sponge-Bed is rich in microscopic organisms. The *Zigzag* Bed (very similar to its equivalent in the Burton-Bradstock-Beaminster-Broadwindsor District) has been observed at North Perrott and Haselbury-Mill Quarry.

The Scroff (*fusca* hemera) was apparently observed by J. F. Walker in a quarry near Misterton Church. Fullers' Earth Clay succeeds the Scroff.

THE ANNALS
AND
MAGAZINE OF NATURAL HISTORY.
[EIGHTH SERIES.]

No. 119. NOVEMBER 1917.

XL.—*The Classification of existing Felidæ.*
By R. I. Pocock, F.R.S.

Introduction.

The number of names quoted below in the lists of suggested synonymy attests the prevalence amongst zoologists, during the last half century or thereabouts, of the conviction that the genus *Felis* of Linnæus was capable of division into several genera. Severtzow and Gray were the most prolific proposers of titles of this rank. Severtzow, however—perhaps wisely,—made no attempt to define his genera; and the characters embodied in the definitions given by Gray seemed scarcely important enough to justify his efforts. Gray began his schismatic work in 1821 and finished it in 1869, overlapping Severtzow, who published in 1853; but since Gray was ignorant of Severtzow's paper, or possibly purposely passed it by because of the omission of diagnoses, the inevitable result was chaotic confusion in the generic nomenclature thus independently suggested.

Other authors have given generic titles to isolated species without attempting a comprehensive revision of the whole group. The only genus dismembered from *Felis* which has met with unanimous acceptance is *Acinonyx* or *Cynailuræ*, of which *jebatus* is the type; but the frequency with which a certain measure of recognition has been specially accorded to *Lynx* luminously reflects the general character of the systematic efforts of authors, because of all the groups of species into which the cats can be divided *Lynx* is itself most nearly related to *Felis*, as exemplified by its typical form.

Practically the only modern classifications employing a selection of the generic terms previously published by Gray, Severtzow, and others are those proposed by Matschie (SB. Ges. nat. Fr. Berlin, 1895, pp. 198-199) and Trouessart (Cat. Mamm., Suppl. pp. 265-278, 1904).

Matschie grouped the species as follows :—

Genus *Uncia* *concolor*, *tigris*, *leo*.

„ *Leopardus pardus* (including *uncia*), *onca*.

„ *Galeopardus viverrina*, *marmorata*, *serval*, *pardalis*.

„ *Felis microtis*, *scripta*, *shawiana*, *bengalensis*, *rubiginosa*, *ornata*, *nigripes*, *tigrina*, *macrura* [*wiedii*], *geoffroyi*, *guigna*.

„ *Catus catus*, *manul*, *caudata*, *planiceps*, *chaus*, *maniculata* [*ocreata*], *pajeros*, *colocolo*, etc.

„ *Lynx lynx*, *caracal*, etc.

„ *Neofelis nebulosa*.

„ [Self-coloured Cats] *temmincki*, *aurata*, *yaguarondi*.

Trouessart followed Matschie in some respects, but used in several cases different names :—

Genus *Felis*.

Subgen. *Uncia* *leo*, *tigris*, *concolor*.

„ *Leopardus pardus*, *uncia*, *onca*.

„ *Zibethailurus viverrina*, *marmorata*, *nebulosa*, *serval*, *pardalis*.

„ *Oncoides microtis*, *shawiana*, *scripta*, *bengalensis*, *rubiginosa*, *ornata*, *wiedii*, *tigrina*, *geoffroyi*, *guigna*.

„ *Felis catus*, *manul*, *planiceps*, *libyca* [*ocreata*], *nigripes*, *pajeros*, *colocolo*.

„ *Catopuma temmincki*, *badia*, *aurata*, *yaguarondi*.

Genus *Lynx* with subgen. *Lynx*. *Cervaria*, *Caracal*.

I have elsewhere* criticised, both from the systematic and nominal standpoints, Matschie's genera *Uncia* and *Leopardus*. Neither in these cases nor in the case of the rest of the genera are any reasons vouchsafed for the specific groupings or for the names employed; and since such widely different forms as *planiceps*, *manul*, and *colocolo* are placed in the same genus and such closely related forms as *ornata* and *ocreata* in different genera†, further discussion of the

* Ann. & Mag. Nat. Hist. (8) xviii. p. 316 (1916).

† This same applies to Gray's classification (Noy. Acta. Kais. Acad. Leop. lxiii. no. 1, pp. 76-77, 1894). Although this author adopted what he called subgenera, it does not appear to me that the names are worth quoting in synonymy when such subgeneric terms as "*Unciaformis*," "*Cati*," and "*Pardina der alten Welt*," are enlisted with *Servalina*, *Tigrina*, and others. The names, at any rate, are in all cases antedated.

question would be profitless. So also with Trouessart's classification. The truth is that neither of these authors had sufficient acquaintance with the forms dealt with to allocate them otherwise than by conjecture. Moreover, their choice of generic and subgeneric terms was by no means in accordance with the rules of nomenclature.

In a series of five papers* on the existing Felidæ, I have recently discussed various characters, both cranial and external, which—for the most part, at all events—have not been employed hitherto in the discrimination of species and genera. Particular attention was drawn to the structure of the hyoid apparatus, of the tympanic bulla, of the feet and the rhinarium, and it was shown (1) that *F. leo*, *tigris*, *onca*, *pardus*, and *uncia*, which differ from the rest of the family in having the suspensorium of the hyoid imperfectly ossified, constitute a little group of Felidæ containing two genera, *Panthera* and *Uncia*; (2) that *Acinonyx* may be distinguished by the complete absence of cutaneous sheaths guarding the claws; and (3) that in the remaining species, all provisionally referred to *Felis*, there is very considerable variation in the structure of the feet, the size and shape of the rhinarium, and the structure of the auditory bullæ. These characters and others have been used in the following attempt to classify the existing species of Felidæ; but my main purpose in publishing what follows has been to show the true relationship of the species to one another, so far as it can be determined, and to dispose of such prevalent but fictitious groupings as those which imply that the lion (*leo*) and the puma (*concolor*) are closely allied and that the lynx (*lynx*) differs more from the domestic cat (*catus*) than the latter differs from the tiger (*tigris*) †.

The consideration of generic names, although of subordinate importance, has been inevitable. Probably no two authors will be quite in accord on the delimitation of the genera. In the present state of our knowledge and with the rapidly shifting conception of the value of the terms "genera" and "species," it would be idle to claim finality on this subject, and I do not pretend in all cases to have been consistent in the admission of species to generic rank. In some cases I may have gone too far, as in the severance of *Zibethailurus* from *Prionailurus*; in others not far enough,

* Ann. & Mag. Nat. Hist. (8) xviii. pp. 222-229, 1916 (Aug.); pp. 306-316 (Sept.); pp. 326-334 (Oct.); pp. 419-429 (Nov.), and xix. pp. 113-130, 1917 (Jan.).

† Perhaps the most important point connected with correctness of view on these and similar matters is that erroneous affiliation of species may be hopelessly misleading to students of geographical distribution.

as in the retention of *nigripes* and *chaus* in *Felis*, of *caracal* in *Lynx*, and of *rubiginosa* in *Prionailurus*. But such questions, in reality of no great moment, can easily be adjusted later, if modification is considered desirable.

Even if time and space had permitted, it would have been beyond my present purpose to attempt complete descriptions of the skulls of the genera admitted. Only the points that appeared to me useful in determining the genera have been referred to. Some of them may probably break down when further material is examined. Others, on the contrary, may be discovered or used; and since we are still in ignorance of the external characters of several of the genera, and since the study of the so-called tiger-cats of the tropics is hedged with difficulties, the classification, although I believe it to be in the main correct, is still in many respects tentative.

In the choice of names I have been guided strictly by priority, so far as it could be ascertained; and in the case of the names proposed by Severtzow line-priority has been taken as the determining factor in the selection.

The Subfamilies of Felidæ.

Reverting to the papers I have recently published on the external and cranial characters of cats, I propose to emphasize the characters distinctive of *Panthera* and *Uncia* and of *Acinonyx* as compared with the rest of the genera of Felidæ, by dividing this family into three subfamilies as follows:—

1. **FELINÆ.**—Suspensorium of the hyoid normally ossified, holding the larynx close up to the base of the skull and restricting its movement. Tips of the digits of both fore and hind feet furnished at least with a single cutaneous lobe protecting the retracted claw on the inner side of digits 2 and 3 and on the outer side of digits 4 and 5.

Containing the genera characterised in this paper.

2. **ACINONYCHINÆ.**—Resembling the Felinæ in the structure of the hyoid, but differing from them and from the Pantherinæ in the total suppression of the cutaneous lobes guarding the claws.

Genus *Acinonyx* (*Cynailurus*) for *jubatus*.

3. **PANTHERINÆ.**—Suspensorium of the hyoid imperfectly ossified, its inferior portion consisting of a larger or shorter elastic tendon conferring great mobility upon

the larynx, which is not held close up to the base of the skull. Feet like those of the Felinæ.

Genus *Panthera* for *leo*, *tigris*, *pardus*, *onca*.

„ *Uncia* for *uncia*.

The Genera of the Subfamily Felinæ.

Genus FELIS, Linn.

Felis, Linn., 1758; type *catus*, Linn. (domestic cat).

Catus, Fitz., 1855, p. 265; type *catus*, Linn.

Catolynx, Severtzow, 1858, p. 385; type *catus*, Linn.

Otailurus, Severtzow, 1858, p. 388; type *megalotis*, Müll. (domestic cat from Timor).

Chaus, Gray, 1843, pp. 44-45; type *chaus*, Guld. (= *lybicus*, Gray).

Distr. Central and Southern Europe; South Asia to Burma; Africa apart from the western forested area.

Very small to medium-sized cats with long (*ocreata*) or moderately long (*chaus*) tails, usually short broad heads, reduced rhinarium, large, pointed, sometimes pencilled ears, never showing the white spot, vertically contracted ocular pupil and narrow paws with comparatively poorly developed claw-sheaths and moderately extensive emarginate webs.

Miller's full description* of the skull of *F. silvestris* and his comparison of the skull of *F. ocreata* (*sarda*) with it embody most of the characters of the typical species of this genus and make a repetition of the facts unnecessary.

The species may be referred to three categories:—

(1) Medium-sized cats from Europe, S.W. Asia, and Africa. e.g. *F. silvestris*, *ocreata*, *ornata*, and *caudata*, which are grouped closely round the typical form of the genus, *F. catus*, and the other domesticated breed, *F. torquata* †.

(2) Larger species ranging from Burma, through India, parts of Central Asia to South Africa, e.g. *F. chaus* (subspecies *furax* etc.) and *F. shawiana*, with the skull longer, narrower, less arched, and the zygomata less salient than in the typical forms. These constitute the genus *Chaus* of Gray, defined by the comparative shortness of the tail.

(3) The very small South-African species *F. nigripes*, which in many of its cranial characters is like a dwarfed form

* Cat. Mamm. Centr. Europe, pp. 458-468 (1912).

† Miller admits three species of European cats, namely, *F. silvestris*, *F. sarda*, and *F. agrius*. *F. sarda*, however, appears to me to be at most a subspecies of *F. ocreata*, and there is no evidence that *F. agrius*, from Crete, was based upon anything but feral examples of the striped domestic cat (see P. Z. S. 1907, pp. 143-168).

of *F. orreata* with certain peculiarities added. For instance, the suborbital portion of the malar arch is very deep, with its upper margin thin and the anteorbital thickening almost obliterated; the postorbital processes incline backwards, have a sinuous curvature, and an upturned anterior edge; the bulke and auditory meatus are relatively enormous, and the inner lobe on the upper carnassial is greatly reduced (see Pocock, P. Z. S. 1907, pp. 669-674).

Genus *LYNX*, Kerr.

Lynx, Kerr, 1792, p. 41; type *lynx*, Linn.

Lynceus, Gray, 1821, p. 302 (preocc.); type *lynx*.

Lyncus, Gray, 1825, p. 339; type *lynx*.

Lynchus, Jardine, 1834, p. 274; type *lynx*.

Pardina, Kaup, 1829, p. 53; type *pardellus*, Miller.

Cervaria, Gray, 1867, p. 276 (preocc.); type *pardellus*, Miller.

Eucervaria, Palmer, 1903; type *pardellus*, Miller.

Caracal, Gray, 1843, p. 46; type *caracal*, Guld. (= *melanotis*, Gray).

Urolynchus, Severtzow, 1858, p. 388; type *caracal*, Guld.

Distr. Boreal and temperate latitudes of northern hemispheres as far south as the Mediterranean and Western Himalayas and Mexico (true lynxes); South-western Asia and the whole of Africa (caracals).

Medium-sized, short or comparatively short-tailed cats with large triangular tufted ears, short, broad heads, circular ocular pupils and large paws with well-developed claw-sheaths, comparatively short, emarginate webs.

Miller's description of the skulls of European lynxes and his detailed comparison between them and the skull of *F. silvestris* make a repetition of the facts unnecessary. He separates the genus *Lynx* from *Felis*, laying particular stress upon the doubtful characters afforded by the absence in *Lynx* of the small upper premolars. That the two genera are closely related is obvious from Miller's description, and this conclusion is confirmed by the similarity in the size and shape of the partition of the bullæ. The principal characters differentiating *Lynx* are supplied by the slender and gradually attenuated nasal branch of the premaxillæ, the thinner, less depressed, and sharper postorbital processes, the shallower notching of the suborbital edge of the palate, the proximity to the canine and more forward setting of the first large upper premolar.

The species fall into three groups* :—

(1) The typical lynxes (*Lynx* s. s.) comprising *L. lynx*, *pardellus*, *isabellinus*, and *canadensis*, and probably other species or subspecies.

(2) The lynxes of temperate America, *L. rufus*, *fasciatus*, etc., which Allen and Bangs (see Proc. Biol. Soc. Wash. xi. pp. 48-49, 1897) have shown to differ in certain characters from the typical lynxes—namely, the narrower nose, longer junction between maxillæ and nasals, narrower presphenoid, less rounded mesopterygoid fossa, closer proximity between condyloid foramen and foramen lacerum posterius, longer tail, etc. Bangs proposed to distinguish these as a subgenus entitled *Cervaria* (*Eucervaria*), but this name belongs, as Miller has shown, to the Spanish lynx (*L. pardellus*), which does not exhibit the characters of the temperate American forms.

(3) The caracals (*L. caracal*) of Africa and India were distinguished generically by Gray on the strength of the longer tail and the alleged equality in length of the limbs. The latter feature is fictitious, caracals, like the true lynxes, being higher on the hind than on the fore limbs.

The skull resembles that of the lynxes in general characters, but is usually narrower in the cranial and facial portions, so that the zygomata appear more expanded. The nasals are usually less attenuated posteriorly, the preorbital foramen is longer, and the small upper premolar is often retained for a longer period. More important is the development of the external pterygoid crest, which recalls that of *Felis* and is practically suppressed in the true lynxes.

Genus TRICHÆLURUS, Satunin.

Otocalobus, Severtz. 1858, p. 386 (preocc.); type *manul*, Pall.

Trichælurus, Satunin, pp. 495 (1905); type *manul*, Pall.

Distr. Central Asia as far south as the western Himalayas.
One species known.

A small long-tailed cat with a broad head and short, rounded, widely separated ears, and a circular ocular pupil.

Skull, generally speaking, of the *Felis* and *Lynx* type, but broader and shorter, with the face steeply sloped from a point near the middle of the orbit; the orbits set higher, with a more forward aspect, their lower edge compressed,

* Not including the little-known *L. sardinie*, Mola (Boll. Soc. Zool. Ital. Rome, (2) ix. p. 48, 1908), which has the tail relatively as long as in *L. caracal*.

without thickening, but a deep bridge above the preorbital foramen, and the malar continued as a thin strip up to the frontal in front of the lacrymal foramen; nasal branch of premaxilla not broad, evenly attenuated; anterior nares set low down, the upper edge hardly above the inferior edge of the orbit; palate wider than long, without conspicuous notch on the suborbital edge; basisphenoid markedly concave longitudinally; bulla advancing slightly in front of the glenoid ridge, its outer chamber as large as the inner, the partition extending to the occipito-sphenoidal suture; small upper first premolar and inner cusp of carnassial suppressed*.

Trichælurus is in some particulars intermediate between *Felis* and *Lynx*, the circular pupil, narrower premaxillæ, shallow notching of suborbital edge of palate, and suppression of small upper premolar being lyncine characters. The genus, however, may be easily distinguished by the sum of a number of structural peculiarities.

Genus PUMA, Jardine.

Puma, Jardine, 1834, p. 206; Severtzow, 1858, p. 123; type *concolor*, Linn.†.

Distr. From the United States to Patagonia.

Many species or subspecies, according to the fancy of authors.

Large, long-tailed cats with comparatively small, rounded, black ears without a white patch; the pattern‡, suppressed in the adult, consists in the cubs of solid dark spots and blotches of irregular shape, often arranged on each side in about four ill-defined rows and one along the spine; and on the head and nape there are often four longitudinal stripes and one running backwards from the eye beneath the ear, as in typical *Felidæ*. The rhinarium is naked above and moderately prominent. Except that the feet are broader, they do not differ greatly in form from those of *Felis* in the development of the webs and claw-sheaths.

The skull is short and broad, with complete sagittal crest, moderately deep and rounded postorbital constriction, quite short, widely separated postorbital processes, and salient

* For further particulars about this cat see Pocock, P. Z. S. 1907, pp. 299-306.

† Although Jardine included *F. yamacerondi*, *pajeros*, and others with *concolor* under *Puma*, *concolor* is indicated as the type-species by its ownership of the trivial name "puma," quite apart from the restricted association of the two names by Severtzow.

‡ See Ann. & Mag. Nat. Hist. (7) xx. pp. 442-445 (1907).

zygomata : the muzzle is high and short, the anterior nares large, the nasal bones rather abruptly expanded distally, with longish narrow narial processes, and narrowed, sometimes strongly compressed, posterior portion ; the nasal branch of the premaxilla is narrow and the maxilla is tolerably evenly curved above ; the suborbital portion of the malar arch is thick, but the preorbital thickening is not well marked ; the palate is wide, and its orbital foramen is very large and comparatively close to the foramen of the optic nerve ; the mesopterygoid fossa is wide, short, parallel-sided, with rounded anterior rim, and the edges of the palate in front of it are widely divergent ; the spiniform process of the pterygoid descends somewhat abruptly, and the external pterygoid crest forms merely a short posterior projection or ridge ; the bullæ have a low internal partition, and a transverse line drawn from the stylomastoid divides the bulla into a larger anterior and a smaller posterior portion ; the occiput is wide across the mastoids, emarginate just above the level of the condyles and expanded above. The short upper post-canine space occupied by a well-grown first premolar.

Neither the pattern of the cub nor the structure of the skull indicates, in my opinion, close affiliation between *Puma* and any genus of the Felidæ. In general appearance the skull is, perhaps, most like that of *Lynx caracal* ; but there are many differences, notably the small size of the outer chamber and the lowness of the partition of the bulla in *Puma*, a particular in which *Puma* resembles the other American genera with exception of *Dendrailurus* ; but, apart from this, the skull exhibits none of the characteristics of other American cats.

Genus LEPTAILURUS, Severtz.

Leptailurus, Severtzow, 1858, p. 389 ; type *serval*, Schreb.

Galeopardus, Heuglin, 1866, p. 557 ; type *serval*.

Serval, Gray, 1867, p. 272 ; type *serval*.

One species only, with several local races*.

Distr. Africa, mainly south of the Sahara.

Medium-sized, long-legged, rather short-tailed cats, with narrow heads, very large rhinarium, large, rounded, unpencilled ears, closely juxtaposed on the summit of the head

* Two species have been admitted, namely, *serval* and *servalina*. These, however, are now known to be merely varieties, the species being dimorphic in pattern (P. Z. S. 1915, i. p. 154), the two types of pattern symbolized by the names being found in the same litter.

and retaining the white spot, round ocular pupils and paws approximately as in *Felis*, but with the inner lobe of the sheath of the third digit of the fore foot much larger.

The skull differs from that of *Felis* in several points:—The submalar portion of the maxilla is much lower, the anterior end of the malar bone is greatly expanded and deflexed above the preorbital foramen, and the posterior half of the zygomatic arch is deeper as compared with the anterior portion; the postorbital process of the frontal rises farther forwards on the frontal bone; the nasal branch of the premaxilla is thinner, and the nasals themselves have no forward projection at the tip; the outer chamber and partition of the bulla are smaller, the posterior end of the partition being low and not confluent with the stylomastoid ridge, and, although the mesopterygoid fossa is broad in front and parallel-sided, the external pterygoid crest forms a longish ridge rising far in front of the root of the hamular, and the suborbital edge of the palate is less deeply notched.

In the characters supplied by the bulla, the lowness of the maxilla below the malar, the anterior expansion of the malar, the persistence of a well-developed first upper premolar, as well as in other characters of minor importance, the skull differs from that of *Lynx*.

GENUS PRIONAILURUS, Severtz.

Prionailurus, Severtzow, 1858, p. 387; type *pardochrous*, Gray (= *bengalensis*, Kerr).

Distr. Ceylon and India eastward to Borneo and the Philippines and northwards into China and Amurland.

Small cats with the structure of the rhinarium and feet unrecorded, but differing from *Felis* in having rounded white-spotted ears.

The skull recalls that of *Felis* at first sight, but differs therefrom in the sum of a number of characters. It is narrower as compared with its length and is less dome-shaped in profile view, the face being less steeply sloped from the interorbital region. The frontal postorbital processes are narrower, especially when seen from behind. The nasals are depressed, not everted apically, and the ascending or nasal branch of the premaxilla is more evenly attenuated. The inferior edge of the orbit is less salient, and the posterior half of the zygoma is less arcuate in profile view. The mesopterygoid fossa is narrower, especially anteriorly, with its front border more rounded, and the external pterygoid

crest is better developed, making an elongated pterygoid fossa. The bulla has a low partition.

The two best-known species of the genus are the Indian cats known as *bengalensis** and *rubiginosus*, which are very distinct, *rubiginosus* being characterized by exceedingly thin nasals, nearly vertical nares and premaxillæ, and superiorly expanded maxillæ, the temporal ridges remain separated, forming a wide lyriiform area, the postorbital processes fuse earlier, and the first upper premolar is much more frequently absent than in *bengalensis*. In the structure of the muzzle and the arrested muscular development of the cranium *rubiginosus* recalls some of the small South-American cats, *pardinoides* and ? *guigna*, but differs therefrom in certain characters enumerated below (p. 347).

Other known forms that certainly, or probably, fall under *Prionailurus* have been named *javensis*, *sumatranus*, *herschellii*, *chinensis*, *microtis*, and *scripta*.

GENUS PARDOFELIS, Severtz.

Pardofelis, Severtzow, 1858, p. 387; type *marmorata*, Martin.

Catolynx, Gray, 1867, p. 267; type *marmorata* (nec *Catolynx*, Severtzow).

Two species, *P. marmorata* and *P. badia*.

Distr. East Indies from the Himalayas to Borneo.

Small long-tailed, short-headed cats with rounded ears, distinguishable from *Prionailurus* and related Oriental genera by having the skull higher and more rounded, with the mesopterygoid fossa lanceolate in front and provided with thickened margins or a better developed external crest.

The two species *marmorata* and *badia* referred to this genus have not, I believe, been previously affiliated. Despite the difference between them in the matter of coloration, their kinship is indicated by cranial characters. The structure of the feet and the form of the rhinarium are unknown to me. Of the two, *P. badia* seems to be most nearly related to *Prionailurus*.

* Based upon a specimen that swam on board a ship in Calcutta. The name has been fixed by tradition to the species that bears it; and since the description, so far as it goes, fits the species and most certainly does not apply to any domesticated cat of the *Felis catus* or *torquatus* types, I see no reason for discarding the term.

Genus *PROFELIS*, Severtz.

Profelis. Severtzow, 1858, p. 386; type *aurata**, Temm. (= *celidogaster*).

Chrysailurus. Severtzow, 1858, p. 389; type *aurata* (= *neglecta*, Gray).

Catopuma, Severtzow, 1858, p. 387; type *temmincki*, Vig. & Horsf. (= *moormensis*, Hodg.).

Pyrofelis, Gray, 1874, p. 354; type *temmincki*.

Two well-marked species, *P. aurata* and *P. temmincki*, the latter at least probably containing subspecies (*dominicanorum*).

Distr. Himalayas and China to Indo-Malaysia (*temmincki*); West-African forest-region (*aurata*).

Medium-sized cats with rounded unspotted ears and moderately long tails, but with other external characters unknown.

Skull much larger than that of *Prionailurus* and differing therefrom in several characters. The nasals are a little broader, the postorbital processes shorter and never confluent; the crest on the malar is close to its inferior edge; the external pterygoid crest extends forwards considerably in front of the hamular, and the occipital area is much broader especially over the summit and across the mastoid processes, its width across the latter exceeding the width of the cranium across the parietals. In its broad nasals and occipital area *Profelis* is very like *Pardofelis*, but differs in the shape of the mesopterygoid fossa, of the external pterygoid crest, the width of the valley between the bulla and the glenoid crest, the shorter postorbital processes, and more sloping chin. From the skull of *Zibethailurus* that of *Profelis* differs in general form and aspect as well as in the shape and width of the occipital area, the position of the malar crest, narrower coronoid processes, etc. With *Ictailurus* and *Neofelis* no special comparison is necessary.

In connection with the mandible it may be noticed that the condyle is high above the angular process, the first premolar is small and considerably lower than the carnassial, and the alveolus of the canine is elevated. From this it results that there is a high postcanine space, the first little premolar of the maxilla, when retained, being widely separated from the first premolar of the mandible.

The species of this genus fall into two groups widely separated geographically, both being dimorphic in colour:—

(1) The West-African species *P. aurata*, assigned to *Profelis* and *Chrysailurus* by Severtzow, and ranging from Sierra

* For specific synonymy of this species see P. Z. S. 1907, p. 656.

Leone to the Ituri forest, a species which appears to be more nearly related to *Prionailurus* than the Asiatic representative of the genus, *P. temmincki*. The first upper premolar is markedly larger, when retained, than in *P. temmincki*; the external pterygoid crest is less well developed, especially posteriorly, where it exhibits a distinct notch before its spiniform termination: the occipital area is not so wide and shows a shallow emargination on each side, and the ridge below the masseteric fossa of the mandible is not so large.

(2) The Asiatic species, assigned to *Colopuma* by Severtzow and to *Pyrofelis* by Gray, has the first upper premolar minute, when retained, the postorbital processes are longer, the external pterygoid crest very well developed, especially posteriorly, where it ends in a spine but exhibits no notch; the occipital area is very wide and has no distinct lateral emargination, and the crest below the masseteric fossa is more salient.

Genus ZIBETHAILURUS, Severtz.

Zibethailurus, Severtzow, 1858, p. 387; type *viverrina*, Benn.

Viverriceps, Gray, 1867, p. 268; type *viverrina*.

Distr. India and Ceylon to Southern China, Formosa, and Tenasserim.

Medium-sized cats with small, rounded, white-spotted ears, moderately large rhinarium, and feet provided with small claw-sheaths and webs of moderate depth.

The skull may be described as a modification of the *Prionailurus*-type, many, but not all, of the differences being attributable to its accommodation to great development of the masticatory muscles. The sagittal crest is completed by the coalescence of the temporal ridges at a much earlier age, and the postorbital constriction forms in adult and subadult specimens a long emargination of the frontal on each side, instead of an angular notch immediately behind the process as in *Prionailurus*. Similarly, the lateral edges of the occipital area are more deeply emarginate and the coronoid of the mandible is broader at the summit.

The ascending branch of the premaxilla is broader than in *Prionailurus*. The inferior edge of the orbit is thicker and the anteorbital excrescences very conspicuous, and the cheek between the alveolar border and the orbit is relatively lower. The suborbital edge of the palate is less conspicuously notched. The external pterygoid crest is represented by a small triangular ridge above the hamular, being

noticeably shorter and less well developed than in *Prionailurus*.

Genus ICTAILURUS, Severtz.

"Ailurin," Gervais, 1855, p. 86; for *planiceps*, Vig. & Horsf.*.

Ictailurus, Severtzow, 1858, p. 387; type *planiceps*.

Ailurogale, Fitzinger, 1869, p. 249; type *planiceps*.

Elurina, Gill, 1871, p. 60; type *planiceps*.

Plethailurus, Cope, 1882, p. 475; type *planiceps*.

Only one species hitherto admitted.

Distr. Malay Peninsula to Borneo.

The skull in its elongated shape, the structure of the bulke, exceedingly compressed nasals, and deep postorbital constriction recalls in a measure that of *Zibethailurus*, but may be distinguished by several peculiarities both dental and cranial†. (1) The posterior border of the complete post-orbital bar is scarcely convex owing to the great width of the base of the malar portion. (2) The nasal branch of the premaxilla is slender and tolerably evenly attenuated. (3) The mesopterygoid fossa is very narrow, about twice as long as wide or even more. (4) The muzzle is broad and the palate nearly parallel-sided, the distance between the two anterior premolars being about equal to the distance between the inner cusps of the upper carnassials, and the suborbital edge of the palate has a conspicuous and narrow notch. (5) The occipital area is narrow, with a shallow lateral emargination, and the summit much more pointed than in *Zibethailurus*.

In the mandible the coronoid is low, with a wide summit set well in advance of the backwardly projecting condyle and angular. The anterior end of each ramus, carrying the canine and incisor teeth, is strongly elevated, and there is a large postcanine gap when the jaws are closed.

In the teeth the first upper premolar is unusually large

* Although Gervais was the first author to give nominal distinction to this genus, the name he proposed is inadmissible, as a comparison between it and such terms as "Chacal" and "Renard" of the same work will show. By Gray *planiceps* was associated with *viverrina* under his genus *Viverriceps*.

† Whether the resemblances between these two cats are due to close affinity or are merely adaptive it seems to me to be impossible to say. If the former, the two supply an interesting exception to the general rule in the Felidæ that the smaller species of a genus have skulls of a more juvenile type than the larger, owing to the lesser development of constrictions and ridges associated with powerful masticatory muscles. *I. planiceps*, although considerably smaller than *Z. viverrina*, has, nevertheless, a skull indicating relatively greater masticatory power.

and two-rooted, with a conical pointed crown, carrying a small anterior cusp. The first premolar of the lower jaw has an almost steeple-shaped crown higher than its basal length and than the apex of the succeeding tooth, and blocking the space between the first and second upper premolars; and the lower canines, when the jaw is closed, project considerably above the lower edge of the anterior nares, their tips being approximately on a level with the summit of the coronoid process.

The external characters of this species are known to me only from skins, and I am unable to give any particulars regarding the feet, rhinarium, and other points.

Genus NEOFELIS, Gray.

Neofelis, Gray, 1867, p. 265; type *nebulosa* (= *macrocelis*).

One species hitherto admitted with several subspecies, possibly deserving higher rank.

Distr. Eastern Himalayas to Borneo.

Large cats with head, body, and tail long and the legs short; with ears rounded and rhinarium and feet scarcely differing from those of *Panthera*.

Skull recalling in general features that of a small example of *Panthera pardus*, especially in the shortness and wide separation of the frontal and malar postorbital processes, the inferiorly attenuated maxilla, the straightness of its nasal edge, the width and exposure of the nasals from the lateral aspect, the inclination of the nares, relative proportions of the mandibular teeth, etc., but differing in the greater posterior width of the nasals, the thicker, more salient inferior edge of the orbit, carrying a distinct preorbital thickening, the evenly ovate antero-lateral border of the mesopterygoid fossa and the special modifications of the jaws, the mandible being greatly elevated anteriorly, with the symphyseal region nearly vertical, flat in its upper two-thirds and abruptly curved backwards below, the incisive border being raised high above the external edge of the alveolus of the lower canine—as a result of which modifications the upper jaw is thrust up so that when the mouth is closed the alveolar lines of the maxillary and mandibular cheek-teeth are widely divergent in front, leaving a deep and long space behind the canines, with concomitant reduction or suppression of the first upper premolar and enormous elongation of the upper canine.

The occipital area is remarkably triangular and pointed

above, and the partition of the bulla is low, as in other forest-species.

This genus cannot be confused with any of the smaller Oriental, African, or American genera of Felidae. Perhaps *Pardufelis* is its nearest ally. By Severtzow it was associated with *Uncia*, by Trouessart it was placed with *serval*, *pardalis*, and others in *Zibethailurus*. From *Panthera pardus*, with which it has been compared above, it differs in the hyoid bone etc.

Genus LEOPARDUS, Gray.

Leopardus, Gray, 1842, p. 260; type *griseus*, Gray (= ? *pardalis*, Linn.) *.

Oncoides, Severtzow, 1858, p. 386; type *pardalis*.

Pardalis, Gray, 1867, p. 270; type *pardalis*.

Distr. From the Sonoran district of North America southwards throughout the forested districts of South America.

An uncertain number of species or subspecies referable to two groups typified respectively by *pardalis* and *wiedii* (*macrura*).

Moderately large or medium-sized cats, with the ears small, rounded, and white-spotted; the rhinarium prominent and naked above, and with widely separated nostrils; feet fully webbed and with well-developed claw-sheaths concealing the tips of the retracted claws; hair on the neck upright or reversed in direction of growth in the adult.

Skull variable in size and shape, and in the typical form of *Leopardus* most like that of *Profelis* of all the genera of the Old World, but differing in the sum of a number of characters. The nasals, though broad in front, are narrower posteriorly and fit like a wedge between the maxillæ, which are differently shaped above from those of *Profelis*, being broader and more truncated at the summit, the suture between them and the nasal processes of the frontal inclining more obliquely inwards and forwards from the dorsal aspect

* Gray originally included four species in this genus, namely, *griseus*, *pictus*, *elliotti*, and *horsfieldi*, but subsequently assigned *griseus* and *pictus* to *Pardalis*, *elliotti* to *Viverriceps*, ignored *horsfieldi*, and applied *Leopardus* to *pardus* and *onca*. Since *Leopardus* must unfortunately stand for one of the four species first included under it, I selected *griseus*, perhaps a subspecies of *pardalis*, as the type (Ann. & Mag. Nat. Hist. (8) xviii. p. 316, 1906).

than in *Profelis*, and the facial portion of the frontal anterior to the root of the postorbital process is larger and the lacrymal extends higher above the malar arch within the orbit. The skulls are variable in these respects, but, on the whole, the arrangement of the bones above described gives a different aspect to the skulls of *Leopardus* as compared with *Profelis*. The mesopterygoid fossa is more pointed as a rule in front, and has more sinuous margins owing to the curvature of the pterygoid bones. The bullæ are differently shaped from those of all the Old-World tiger-cats in that the portion behind a line drawn from the stylomastoid foramen at right angles to the occipital axis is larger than the portion in front of it.

In the mandible the condyle is not so high above the angular process as in *Profelis*, the first premolar is higher as compared with the carnassial than in that genus, and when the jaw is closed reaches up to the comparatively large first premolar of the maxilla, so that, as in *Leptailurus*, the post-canine space is quite small—a feature not observable in the Asiatic tiger-cats.

In addition to the true ocelots, often called jaguars*, I refer to this genus *L. wiedii* (*macroura*), commonly cited as *tigrina*†, which may be described as a small, long-tailed, smooth-skulled representative of the ocelots. The skull is like that of a young ocelot in most respects, showing at most a shallow postorbital constriction, with the temporal crests forming a lyriiform area generally wide but varying in width with age and possibly locally. The skulls differ, however, from those of ocelots in having a tolerably regularly rounded low occipital area; even when the occipital crest is well developed its edges have no definite lateral emargination; and the inferior edge of the orbit is thin, with the preorbital thickening hardly developed. In this last-mentioned particular, as well as superficially and in size, the skulls recall those of *Pardofelis*, but the maxillæ are wider above, the nasals narrower posteriorly, the malar arch is shallower from above downwards, the postorbital processes, although as long as in *Pardofelis*, are thinner, the back of the cranium is longer, and the occipital plane more vertical, the posterior part of the bulla is larger, the sides of the mesopterygoid fossa thinner, and the chin much more sloped.

* Schreber's figure of *Felis onca*, Linn., represents an ocelot (*Leopardus pardalis*), and not the species which is trivially known as the jaguar (*Panthera onca*).

† For the position of this species see below under *Herpailurus*.

As stated above, the skulls of typical *Leopardus* (ocelots) are very variable, and some of them show a decided approximation to those of *L. wiedii*.

Genus *HERPAILURUS*, Severtz.

Herpailurus, Severtzow, 1858, p. 385; type *yaguarondi*, Desm.

Oncifelis, Severtzow, 1851, p. 386; type *geoffroyi*, Gerv.

Noctifelis, Severtzow, 1858, p. 386; type *guigna*, Mol.

Pardalina, Gray, 1867, p. 266; type *geoffroyi* (= *himalayana*, Warw.).

Margay, Gray, 1867, p. 271; type *tigrina*, Schreb.*.

Distr. From Texas in the Sonoran area of North America as far south as the Argentine and Chili in South America.

Quite an uncertain number of species and subspecies referable to two well-marked types represented by *Herpailurus yaguarondi* and *Oncifelis geoffroyi*.

At least differing in external characters from *Leopardus* by the comparatively poor development of the webs and claw-sheath on the feet.

Skull variable, but presenting the following combination of characters:—The cranial portion is long and the facial short, and the dorsal contour is never strongly convex longitudinally, the temporal crests are almost always separated, forming either a narrow or a wide lyriiform area, rarely a complete sagittal ridge. The muzzle is compressed above, and the narrowest part of the interorbital region is situated forwards just behind the naso-maxillary line, and this line continued passes through the anterior half of the orbit, not approximately through its centre; the maxilla is very broad above, with horizontal or nearly horizontal upper edge, prominent rounded antero-superior angle, and vertical, or nearly vertical, anterior border. These features give a peculiar "facies" to the skull traceable in all species. In addition, the first upper premolar is minute or absent; the mesopterygoid fossa is slightly or considerably narrowed in front, with rounded angles and a small median notch in its anterior border; the inner chamber of the bulla is never much inflated anteriorly and does not project far beyond the partition, which is low or very low; the occipital crest is not appreciably concave above the condyles and is considerably broader at that point than the condylar width.

* For the determination and allocation of this species, previously regarded as identical with *Leopardus wiedii*, see Thomas (Ann. & Mag. Nat. Hist. (7) xii. pp. 234-239, 1903) and Pocock (Ann. & Mag. Nat. Hist. (8) xix. p. 43, 1917). In the latter paper the other American species of Felidae were grouped on the lines amplified in the present communication.

H. yaguarondi and *H. geoffroyi* are widely divergent species in cranial characters, the former departing the most, the latter the least, from the typical feline type. In *H. yaguarondi* the anterior nares are subvertical; the post-orbital processes of the frontal are short and depressed, but the malar process is longish; the zygomata are weakly arched, with the suborbital portion less salient above the carnassial and the squamosal root very long from before backwards, with its posterior border strongly inclined forwards and outwards; the valley between the bulla and the glenoid ridge is wider; the occipital area is narrow across the mastoids, and the crest is less strongly inclined backwards and inwards; the temporal crests always form a wide lyriform area.

On account of the differences in the skulls the two species might be regarded as generically or subgenerically distinct, but the difficulties of definition would in that case be great on account of *H. pardinoides* and its allies occupying in many cranial respects an intermediate position between the two, as Thomas pointed out in 1903.

The names *yaguarondi* and *eyra* were given, I believe, to colour-phases of one and the same species, the former being blackish with speckled hair, the latter red. Neither form shows pattern in the adult. If newly born kittens show pattern at all, which by the analogy of *Lynx caracal* is uncertain, it may be predicted that it will be like that of *H. pardinoides*, *guigna*, or *geoffroyi*. It may be added that the skull of *H. yaguarondi* differs widely from that of *Puma concolor* and completely negatives the claim of relationship that has been made between the two species on account of the absence of pattern in the adults.

Some of the smaller spotted species of the *pardinoides* and *tigrina* types of this genus, with the skull smooth and rounded, recall on superficial inspection the smaller species of *Prionailurus* like *bengalensis*, more particularly in the large size of the orbit, the shortness of the muzzle, expanded maxilla, and the vertical truncature of the anterior nares. The two, however, differ as follows:—

The *P. bengalensis*-type.

Postorbital processes long, often confluent.

Preorbital constriction narrowest midway along orbit, usually well behind maxilla and nasals.

Masseteric ridge advancing to middle of malar.

The *H. pardinoides*-type.

Postorbital processes short and subspiniiform.

Preorbital constriction narrowest in front of centre of orbit and close behind maxilla and nasals.

Masseteric ridge near lower edge of malar.

The *P. bengalensis*-type.

Mesopterygoid fossa parallel-sided, with transverse anterior edge.

Base of cranium short; bulla more inflated in front; occiput narrower above, with its lateral margins sloping inwards.

The *H. pardinoides*-type.

Mesopterygoid fossa narrow and rounded in front.

Base of cranium long; bulla narrower in front; occiput more widely rounded above, its lateral margins more upright.

Genus DENDRAILURUS, Severtz.

Dendrailurus, Severtzow, 1858, p. 385; type *colocolo*, II. Smith (= *strigilata*, Wagn.).

Lynchailurus, Severtzow, 1858, p. 385; type *pajeros*, Desm.

Pajeros, Gray, 1867, p. 269; type *pajeros* (= *pampanus*, Gray).

Distr. S. America : Guiana, Chili ; Uruguay to Patagonia.

Two species, if distinct, namely *colocolo* and *pajeros*.

Skull with the same general features as *Herpailurus*, but with widely different bullæ, which are not only more inflated and globular, extending posteriorly as far as the inferior edge of the foramen magnum and anteriorly almost as far as the ridge of the condyloid surface of the mandible, but differ in addition in the relatively enormous size of the outer or auditory chamber, which recalls that of *T. manul*. The groove of the partition runs over the summit of the bulla from the stylomastoid to a point just in front of the basi-occipital suture. The partition itself is nearly vertical with a convex inner wall. The external or auditory chamber is as wide in front as the posterior chamber is behind and projects forwards far in advance of the very narrow anterior end of the posterior chamber.

The following analytical key to the genera of Felinæ epitomises their main characters ; but, although an attempt has been made to juxtapose related forms, this method has been purposely abandoned in some cases in the interests of expediency in construction. For instance, *Ictailurus* and *Dendrailurus* have been widely separated from their allies, *Ictailurus* being, in my opinion, most nearly akin to *Zibethailurus* and *Dendrailurus* to *Herpailurus*, the only cranial similarity which brings *Dendrailurus* and *Trichæ-lurus* together in the table having been independently acquired :—

Very long upper canines and immense postcanine space; chin long and vertical; nasals broad throughout; their maxillo-premaxillary suture almost straight; postorbital processes very short; occiput angular above.....

Without that combination of characters.....

Neofelis.

a.

- a. First upper *pm* long, conical, two-rooted; first lower *pm* higher than second; postorbital bar complete, with slightly rounded posterior margin; condyle and angular set well behind broad rounded coronoid; tip of lower canine projecting high above lower edge of nares *Ictailurus.*
Without that combination of characters b.
- b. Rhinarium very large; ears nearly meeting on summit of head. Malar greatly expanded in front, where it is clamped externally to preorbital foramen; cheek low; narrow postcanine space .. *Leptailurus.*
Without that combination of characters c.
- c. Outer chamber of bulla very large, extending in front of narrowed apex of inner chamber; groove of partition passing from stylomastoid foramen to basioccipital suture d.
Outer chamber of bulla smaller or very small, not extending anteriorly in front of wider end of inner chamber, groove of partition passing to anterior edge of bulla e.
- d. Face strongly sloped; upper rim of anterior nares nearly level with compressed lower rim of orbit; forehead and frontal postorbital processes very wide *Trichailurus.*
Face not strongly sloped; upper rim of nares much higher than thickened lower rim of orbit; forehead narrow, postorbital processes slender *Dendrailurus.*
- e. Outer chamber of bulla comparatively large; partition rising some distance from crest of tympanic annulus f.
Outer chamber of bulla small or very small; partition rising close to crest of tympanic annulus g.
- f. Nasal branch of *pmx* broad above behind nasal, then abruptly pointed; suborbital margins of palate deeply notched; upper *pm'* normally present *Felis.*
Nasal branch of *pmx* gradually attenuated above; suborbital margins of palate not deeply notched; upper *pm'* absent or early deciduous *Lynx.*
- g. Skull short, rounded, zygomata wide, maxilla receding, not expanded above; palatine foramen in orbit very large, the distance between it and the orbital foramen only a little greater than the width of the wide, short mesopterygoid fossa and than the anterior nares; palate broad, sides of its posterior elongation widely divergent; postorbital processes short, blunt; occiput wide across mastoids *Puma.*
Without that combination of characters h.
- h. Mesopterygoid fossa lanceolate in front, with very thick lateral edges or large external crest; skull short, broad and high *Pardofelis.*
Without that combination of characters i.
- i. External pterygoid crest reduced to a small triangular lamina; preorbital thickening of malar

- very large; masseteric crest on malar remote from its lower edge; skull powerful, with strong constrictions and upper half of occiput narrow but rounded above; coronoid wide and rounded at summit. *Zibethailurus.*
- Without that combination of characters *j.*
- j.* Masseteric crest on malar remote from its inferior edge; narrowest point of preorbital constriction nearly over the centre of the orbit; postorbital processes long, often confluent, occipital area narrow, its width across the mastoids less than the width of the cranium, its sides hardly emarginate, its summit rather narrowly rounded, and its width halfway above the condyles, about equal to the transcondylar width; portion of bulla behind the stylomastoid smaller than that in front of it. *Prionailurus.*
- Without that combination of characters *k.*
- k.* Skull powerfully developed with wide occiput, narrowest point of preorbital constriction nearly above centre of orbital space, maxilla not expanded above and inclined back well beyond lacrymal foramen; area of bulla behind stylomastoid foramen much smaller than that in front of it; mandible with first premolar much lower than carnassial, condyle high above angular and well-developed submasseteric ridge *Profelis.*
- Without that combination of characters. *l.*
- l.* Feet fully webbed with well-developed claw-sheaths, hair on neck reversed in direction of growth *Leopardus.*
- Feet with only moderately developed webs and claw-sheaths, hair on neck not reversed *Herpailurus.*

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XLI.—Notes on Fossorial Hymenoptera.—XXX. On new Ethiopian Scoliidae. By ROWLAND E. TURNER, F.Z.S., F.E.S.

Family Scoliidae.

Subfamily ELIDINÆ.

Myzine aterrima, sp. n.

♂. Niger, punctatus; capite thoraceque sparse grisco-pubescentibus; tarsis brunneis, intermediis posticisque articulis tribus intermediis, apice excepto, albido-flavidulis; alis fuscis.
Long. 12 mm.

♂. Clypeus widely and very shallowly emarginate at the apex, closely punctured. Antennæ stout, about as long as the thorax and median segment combined, the terminal joint truncate at the apex, shorter than the penultimate; none of the joints arcuate beneath. Front punctured-rugose, the antennal tubercles large and blunt, vertex strongly punctured. Eyes widely emarginate on the inner margin. Thorax and median segment closely and coarsely punctured; the pronotum scarcely as long as the mesonotum, the anterior margin straight. Abdomen rather finely and very closely punctured; the first tergite shorter than the second, rounded at the anterior angles, constricted at the apex; tergites 2-6 slightly constricted at the base, at least twice as broad as long; seventh tergite coarsely rugose at the apex, a narrow sulcus from the base reaching to the base of the apical slit, which is narrow and very deep, the lobes of the tergite on each side of the slit broadly truncate at the apex. Sternites more coarsely punctured than the tergites; the apical aculeus very strongly recurved. Second abscissa of the radius a little longer than the third; second recurrent nervure received at about one-third from the base of the third cubital cell.

Hab. Victoria Falls, Zambesi (*Thompson*), December. From the Rhodesia Museum.

Very distinct in colouring from others of the genus. The only other black Ethiopian species are *klugii*, Westw., in which the wings are hyaline and the structure of the antennæ and anal segments very different, and *stigma*, Turn., which is much smaller and differs in many important points. In the form of the abdomen, especially in the truncate lobes of the seventh tergite, this is closely allied to *semirufa*, Gerst. (= *cingulata*, Gerst.), but the colouring is very different and the sculpture is much coarser in *aterrima*.

Braunsomeria arnoldi, sp. n.

♀. Rufo-testacea; abdomine nigro; segmentis abdominalibus primo dimidio basali sextoque fere toto rufo-testaceis.

Long. 6 mm.

♀. Head subrectangular, nearly as broad as long, shining, and very sparsely punctured; eyes very small, situated close to the base of the mandibles. Thorax and median segment shining, the thorax almost smooth, the median segment sparsely and finely punctured. Pronotum subrectangular, distinctly broader than long; scutellum fully half as long as the median segment, narrowed posteriorly; median segment shorter than the pronotum, slightly broadened posteriorly. Sides of the thorax and median segment sparsely clothed with long fulvous hairs. Abdomen shining, very closely microscopically punctured; the apical tergite almost pointed.

Hab. Bembesi, S. Rhodesia (*G. Arnold*), January.

In the small eyes this resembles *atriceps*, Turn., but differs in the colour of the head and in the much broader median segment. The eyes in *quadratriceps* are much larger, and the punctures of the median segment much larger and sparser.

Elis (Mesa) diversicornis, sp. n.

♂. Niger, albo-pilosus; mandibulis, apice excepto, clypeoque flavis; scapo flagelloque articulis duobus basalibus ferrugineis; alis hyalinis, venis nigris.

Long. 15 mm.

♂. Clypeus broad, truncate at the apex; head coarsely and closely punctured, more finely on the vertex than on the front, the prominence above the base of the antennæ strongly raised, transverse, and yellow at the apex; eyes widely emarginate. Thorax finely and closely punctured; the pronotum shorter than the mesonotum, the anterior margin straight; mesopleuræ more coarsely punctured; median segment rugose. Abdomen shallowly and closely punctured; the first segment as long as the second and third combined, the petiole less than half as long as the swollen apical portion, which has almost parallel sides and is very slightly constricted at the apex. Seventh tergite with large sparse punctures, the apical emargination very small and shallow. The abdomen has obscure blue reflexions both above and below. Third abscissa of the radius a little longer than the second; first recurrent nervure received just beyond the

middle of the second cubital cell, second at one-quarter from the base of the third cubital cell.

Hab. Mlanje, Nyasaland (*S. A. Neave*), February and March.

Probably the male of *E. heterogamia*, Sauss.

Elis (Mesa) mutica, sp. n.

♂. Niger, sparse albo-pilosus; clypeo macula parva apicali, tibiis anticis extus, tarsisque anticis flavis; alis hyalinis, venis nigris. Long. 13 mm.

♂. Clypeus very broadly rounded at the apex; front punctured-rugose, the prominence above the base of the antennæ strongly raised, bilobed; vertex punctured; eyes widely emarginate. Thorax closely punctured; mesopleuræ and median segment rugose; pronotum shorter than the mesonotum. Petiole about half as long as the swollen portion of the first segment which is very distinctly constricted at the apex, the whole segment shorter than the second and third combined; second segment as long as the apical breadth, broadened from the base; emargination of the seventh tergite almost obsolete.

Hab. Bulawayo, Rhodesia (*G. Arnold*), December.

This is very near *E. reticulata*, Cam., differing in the black mandibles and in the colour of the clypeus and legs. The form of the first segment is the same in both species.

Elis (Mesa) spinicollis, sp. n.

♂. Niger; sparse albo-pilosus; mandibulis, apice excepto, flavis; pedibus anticis intermediisque rufo-testaceis; abdomino obscure caruleo-micante; alis hyalinis, venis nigris. Long. 14-16 mm.

♂. Clypeus very finely and closely punctured, covered with short white pubescence; head rugosely punctured, the eyes widely emarginate. Thorax closely punctured; the pronotum as long as the mesonotum, the anterior angles produced into acute spines; median segment rugose. Abdomen slender, minutely and closely punctured; the first segment slender, as long as the second and third combined, the petiole about half as long as the remainder of the segment, which is not strongly swollen and only slightly constricted at the apex. Second segment as long as the apical breadth, broadened from the base. Seventh tergite sparsely punctured, with a

longitudinal carina, shallowly triangularly emarginate at the apex. Second and third abscissæ of the radius subequal, second recurrent nervure received a little beyond one-third from the base of the third cubital cell.

Hab. Bulawayo, S. Rhodesia (*G. Arnold*), February.

This may be distinguished from the very similar male of *E. ruficeps*, Sm., by the slenderer, less swollen first tergite and by the somewhat deeper emargination of the seventh tergite. The form of *ruficeps* taken at Bulawayo has the apical half of the wings infusate as in the typical Natal form. *E. reticulata*, Cam., has the first tergite shaped as in the present species, but the angles of the pronotum are not produced into spines.

Elis (Mesa) adelogamia, Turn.

Plesia (Mesa) adelogamia, Turn. Ann. & Mag. Nat. Hist. (8) i. p. 503 (1908). ♀.

Specimens of this from S. Rhodesia, Bulawayo and Lonely Mine, have the head, mesonotum, scutellum, and fore legs red, but do not seem to differ otherwise from the typical form. They will probably form a subspecies.

Subfamily *SCOLIINÆ*.

Scolia perpolita, sp. n.

♀. Nigra, nitidissima, sparsissime punctata; alis nigro-cæruleis. Long. 32 mm.

♀. Clypeus, front, and vertex smooth and shining; occiput closely and finely punctured; a few scattered punctures between the ocelli and the eyes; a short longitudinal sulcus from between the antennæ reaching halfway to the anterior ocellus. Pronotum closely punctured on the anterior margin and clothed densely with erect black hairs, shining and sparsely punctured on the sides; mesonotum smooth and shining, with scattered punctures at the apex and on the sides, more closely punctured on the anterior margin, an impressed line from the anterior margin not reaching the middle of the segment; scutellum and postscutellum very sparsely punctured; mesopleuræ coarsely rugosely punctured and sparsely clothed with long black hairs. Median segment closely punctured, the lateral lobes broadly smooth at the base. First tergite closely punctured and clothed with black hairs, a large smooth space in the middle at the base; tergites 2-4

with a few scattered punctures, the apical third of each segment closely punctured and with a fringe of black hairs; the punctured area on the fifth tergite more extensive; sixth tergite coarsely punctured and densely clothed with black setæ, broadly rounded at the apex. Sternites shining and sparsely punctured, with ciliæ of black hairs. Spur of the hind tibiæ pointed. Two cubital cells and one recurrent nervure.

Hab. Entebbe, Uganda (*C. G. Gowdey*), August; Bugoma Forest, Unyoro (*S. A. Neave*), December.

Easily distinguished from *S. ruficornis*, Fabr., and *S. melanaria*, Burm., by the very sparse punctures and large smooth spaces.

Scolia wahlbergii, Sauss.

Lacosi wahlbergii, Sauss. Stett. ent. Zeit. xx. p. 183 (1859). ♀.

Scolia wahlbergi, Sauss. et Sichel, Cat. spec. gen. *Scolia*, p. 94 (1864).

♀.

Discolia pallidipilosella, Cam. Ann. Transvaal Mus. ii. p. 120 (1910).

♂.

Scolia wahlbergii, Turn. Ann. & Mag. Nat. Hist. (8) viii. p. 620 (1911).

♂ ♀.

Scolia præcana, Sauss.

Discolia præcana, Saussure, Distant, Naturalist in the Transvaal, p. 222 (1892). ♂.

Discolia heterotrichia, Cam. Ann. Transvaal Mus. ii. p. 119 (1910). ♂.

Campsomeris (Trielis) bulawayoensis, sp. n.

♀. Nigra, fulvo-hirsuta; segmentis abdominalibus fulvo-aureo-fimbriatis; mandibulis basi antennisque ferrugineis; pedibus rufo-testaceis; alis basi flavo-hyalinis, anticis dimidio apicali purpureo suffusis; cellulis cubitalibus duabus; venis ferrugineis.

♂. Niger, albo-pilosus; clypeo lateribus, pronoto margine postico, scutello maculis duabus, interdum obsoletis, postscutello macula transversa, segmentis dorsalibus 2-5, interdum etiam primo, fascia angusta apicali, segmentis ventralibus 2-4 fascia angustissima apicali; femoribus subtus, tibiis anticis intermediisque supra, tarsisque anticis intermediisque basi flavis; tarsis brunneis; alis hyalinis, leviter infumatis, anticis cellulis cubitalibus tribus, venis fusco-ferrugineis.

Long., ♀ ♂, 12 mm.

♀. Clypeus coarsely longitudinally striated; front and vertex rather sparsely punctured, with sparse fulvous hairs, a dense fringe of fulvous hairs on the posterior margin of the head. Thorax and median segment closely punctured, with

sparse fulvous hairs; scutellum shining and almost smooth. Abdomen rather sparsely punctured, much more closely at the apex of the segments than at the base; sixth tergite densely clothed with golden hairs; sixth sternite with a small spine on each side near the base. Hind calcaria strongly spatulate.

♂. Antennæ $5\frac{1}{2}$ mm., costa of fore wing 9 mm. Clypeus very broadly rounded at the apex, with a few large punctures. Eyes very deeply and rather narrowly emarginate; head, thorax, and median segment rather closely punctured and sparsely clothed with whitish hairs. Abdomen shallowly and rather sparsely punctured, with sparse white pubescence, the segments faintly tinged with blue. First tergite bell-shaped, shorter than the second, the apex not constricted and at least half as broad as the apex of the second; seventh tergite punctured-rugose, broadly rounded. Three cubital cells, the third much broader on the radius than on the cubitus, in one specimen only connected with the cubitus by a petiole, recurrent nervures separated on the cubitus by a distance equal to the length of the radial margin of the third cubital cell.

Hab. Bulawayo, Rhodesia (*G. Arnold*), December; Johannesburg (*Kobrow*, Coll. Brauns).

The neururation of the sexes differs as in the Palearctic *villosa*, Fabr., to which the male is very closely related, though the first tergite is a little narrower and more constricted at the apex in *villosa*. The colour of the wings and hairs in the female is very different, also of the legs and antennæ, and the sculpture differs. The female is the type.

Campsomeris (Dielis) curvittata, Cam.

Dielis curvittata, Cameron, Sjöstedt, Kilimandjaro-Meru Exp. ii. p. 229 (1910). ♀.

Elis (Dielis) aureola, Sauss. & Sichel, Cat. spec. gen. *Scolia*, p. 173 (1864) (nec Klug).

As I have previously pointed out, Saussure wrongly identified Klug's species; so apparently Cameron's name must stand for this common species. *D. dispilus*, Cam. 1910, is probably the male.

XIII. — *Notes on Fossorial Hymenoptera*. — XXXI. *On Psammocharidae in the British Museum*. By ROWLAND E. TURNER, F.Z.S., F.E.S.

Genus IRENANGELUS, Schulz.

Irenangelus, Schulz, *Spolia Hymenopterologica*, p. 175 (1906).

Type of the genus, *Irenangelus reversus*, Sm.

1. *Irenangelus reversus*, Sm.

Agenia reversa, Sm. Ann. & Mag. Nat. Hist. (4) xi. p. 448 (1873). ♀.
Pseudagenia reversa, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. p. 42 (1884).

Irenangelus hornus, Schulz, *Spolia Hymenopterologica*, p. 180 (1906).
♀.

Hab. Para ; Oyapok.

2. *Irenangelus ichneumonoides*, Dücke.

Irenangelus ichneumonoides, Dücke, *Revue d'Entomol.* xxvii. p. 51 (1908). ♀ ♂.

Hab. Amazon.

A specimen of this species in the British Museum bears the MS. name *Ceropales exilis*, Bingham, and corresponds well to the description, but is without a black band on the pronotum, and the wings are hyaline, not yellowish, with the costa and radial cell infuscate, as in the type. The median segment is smooth throughout, not finely rugulose at the apex as in the description of the type. I have not seen a typical specimen, but am inclined to regard *exilis* merely as a variety. The front below the antennæ and the clypeus are very much more elongate than in *reversus* ; also the sculpture of the front and the shape of the third cubital cell are very different, as noticed by Dücke.

3. *Irenangelus mexicanus*, sp. n.

♀. Flavo-testacea, nitida ; mandibulis apice, flagelloque, articulis duobus basalibus exceptis, nigris ; alis flavo-hyalinis, iridescentibus, apice late infumatis, venis brunneis.

Long. 9 mm.

♀. Labrum broadly rounded at the apex, not emarginate. Clypeus finely and closely punctured, slightly convex, much

broader than long, clothed with delicate golden pubescence, which extends on to the labrum. Antennæ inserted more than twice as far from the anterior ocellus as from the base of the clypeus, each of the eight apical joints of the flagellum very distinctly narrowed from the base to the apex. Front distinctly raised above the base of the antennæ, with a shallow longitudinal sulcus not reaching the anterior ocellus. Eyes strongly divergent towards the vertex, the inner margin widely but very shallowly subemarginate. Front and vertex smooth. Pronotum smooth, the dorsal surface short and transverse; parapsidal furrows of the mesonotum deep. Median segment longer than broad, narrowed to the apex, smooth and shining, convex. Pleuræ and abdomen sparsely covered with very delicate pale golden pubescence; abdomen rather strongly compressed laterally; the first segment half as long again as the apical breadth, narrowed to the base. First abscissa of the radius shorter than the third, the latter half as long as the second; the third cubital cell receiving the second recurrent nervure at one-third from the apex; the fuscous apical margin does not quite reach the third transverse cubital nervure.

Hab. Omilteme, Guerrero, 8000 ft. (*H. H. Smith*); July.

Easily distinguished from *ichneumonoides* by the absence of black markings, by the smooth front, the much shorter clypeus, and the almost obsolete emargination of the eyes; from *reversus* by the very different form of the third cubital cell, by the absence of a carina on the clypeus, and by the shorter and broader first abdominal segment.

4. *Irenangelus tenuatus*, Turn.

Ceropales tenuatus, Turn. Proc. Zool. Soc. London, p. 340 (1910). ♀.

Hab. Kuranda, Queensland.

This species must be included in the genus, though differing in the very long third cubital cell, which is twice as long on the radius as the second, and in the absence of a raised space above the base of the antennæ. As in the other species, the pronotum does not reach the tegulæ. The neuration is very similar to that of the genus *Xanthampulex*, but the frontal prominence is absent. This prominence is much more developed in *Xanthampulex* than in *Irenangelus*, and, on the whole, I think *tenuatus* is best placed in the latter genus.

I agree with Dücke in considering this genus as allied to *Ceropales*. I have previously expressed my opinion that *Xanthampulex* should be placed near that genus.

The species to be included in *Xanthampulex* are:—

1. *Xanthampulex trifur*, Schulz.

Xanthampulex trifur, Schulz, *Spolia Hymenopterologica*, p. 184 (1906).
♀ ♂.

Hab. Celebes.

2. *Xanthampulex pernix*, Bingh.

Ceropales pernix, Bingh, *Journ. Proc. Linn. Soc., Zool.* xxv. p. 425 (1896). ♂.

Xanthampulex vernix, Turn. *Ann. & Mag. Nat. Hist.* (8) x. p. 361 (1912).

Hab. Tenasserim ; Singapore.

3. *Xanthampulex albovariegata*, Cam.

Ceropales albovariegata, Cam. *Mem. Manchester Lit. & Phil. Soc.* xli. p. 84 (1896).

Xanthampulex albovariegata, Turn. *Ann. & Mag. Nat. Hist.* (8) x. p. 362 (1912).

Hab. Ceylon.

4. *Xanthampulex claripennis*, Cam.

Ceropales claripennis, Cam. *Mem. Manchester Lit. & Phil. Soc.* (4) iv. p. 433 (1891).

Hab. Western India.

Epipompilus delicatus, sp. n.

Pseudagenia delicata, Cam. MS.

♀. Nigra; thorace, segmento mediano, pedibusque rufo-ferrugineis; scapo, segmento dorsali secundo macula parva utrinque femoribusque posticis macula basali pallide flavis; flagello pallide brunneo, apice infuscato; segmento dorsali primo macula basali, secundo dimidio basali, quarto apice, quinto sextoque brunneo-ferrugineis; alis hyalinis, fusco late bifasciatis, venis fuscis.
Long. 6 mm.

♀. Head opaque, with short cinereous pubescence, a distinct frontal sulcus reaching the anterior ocellus. Head somewhat flattened, as in *aztecus*, Cress., the palpi long and slender. Pronotum not more than half as long as the mesonotum, the anterior margin straight, the hind margin broadly and shallowly arcuate, the sides parallel. Median segment convex, narrowed towards the apex, not truncate. Abdomen

smooth and shining; the first segment broadened from the base, a little longer than the apical breadth; second segment much broader than long. Second abscissa of the radius a little longer than the first, a little more than half as long as the third. Cubitella originating far beyond the nervellus. Fore tarsi and hind tibiæ unarmed.

Hab. Bugaba, Panama (*Champion*).

This is very similar to *E. aztecus*, Cress., but is a smaller species, somewhat differently coloured, and with a much shorter pronotum.

Epipompilus aztecus, Cress.

Ferreola azteca, Cress. Proc. Boston Soc. Nat. Hist. xii. p. 376 (1869).

Epipompilus maximiliani, Kohl, Verh. zool.-bot. Ges. Wien, xxxiv. p. 57 (1884). ♀.

Hab. Mexico.

XLIII.—Records of some British Symphyla.

By RICHARD S. BAGNALL, F.L.S.

OF the fourteen species of *Symphyla* now known to occur in the British Isles there is a paucity of records of seven species, viz., *Neoscutigerella hansenii* (Bagn.); *Symphylella dunelmensis* (Bagn.); *S. jacksoni* (Bagn.); *S. isabellæ* (Grassi); *S. horrida* (Bagn.); *S. minutissima* (Bagn.), and *Scolopendrella notacantha*, Gervais.

Some little while ago I found the opportunity of working through several tubes of material and the following records, which extend the range of most of the above species, are taken from the notes I then made. My thanks are due to the several correspondents named in brackets against the records.

Scutigerella immaculata (Newp.).

NORTH WALES, Llandudno, July 1909 (*S. Hirst*); YORKS, Ravenscar, R. S. B.

Scutigerella spinipes, Bagn.

Portlane, 1 (*A. Randell Jackson*); YORKS, Ravenscar, 2, R. S. B.; Malvern (North Hill), 1 mutilated example, April 1909 (*S. Hirst*).

Scutigerella biscutata, Bagn.

YORKS, Ravenscar, 2, R. S. B.

Symphylella jacksoni (Bagn.).

S. WALES, Swansea, single examples dated 2. vii. 14 and 28. vi. 15 (P. A. Buxton).

Previously only known from examples taken by Dr. A. Randell Jackson (in plenty) from the Flintshire side of the Dee Estuary at Queensferry.

Symphylella dunelmensis (Bagn.).

NORTHUMBERLAND, Corbridge, 2 only, and DURHAM, Penshaw Hill, several, R. S. B.

Previously only known from County Durham, where it occurred in numbers at Gibside.

Symphylella isabellæ (Grassi).

NORTHUMBERLAND, Bamburgh, a few only, June 13, 1917, R. S. B.

Only a single example from Penshaw, County Durham, previously known.

Symphylella horrida (Bagn.).

S. WALES, Swansea, 1 immature example, 28. vi. 15 (P. A. Buxton).

Previously known from the Durham Coast near Hartlepool.

Symphylella vulgaris (Hansen).

DEVON, Petit Tor Bay near Babbacombe, 1 example (S. Hirst).

Symphylella minutissima (Bagn.).

SCOTLAND, Edinburgh, Sept. 1912 (W. Evans and R. S. B.); NORTHUMBERLAND, Whitley Bay, 1 immature example, and YORKS, Whitby, 1 immature example, R. S. B.

Previously known from two examples taken at Barnard Castle, Co. Durham.

Scolopendrellopsis subnuda (Hansen).

CHESHIRE, Chester, an undoubted example (A. Randell Jackson), the only record from Cheshire being that of a doubtful immature example from the same source.

Of the known British species *Hanseniella caldaria* (Hansen) is a "hot-house" species; *Scutigerella immaculata*, *S. bi-scutata*, *S. spinipes*, and *Symphlella vulgaris* are more or less common and of wide distribution, whilst *Symphlella delicatula* and *Scolopendrellopsis subnuda* are also widely distributed but much more local. *S. subnuda*, on account of its minute size, may easily be overlooked (and *S. minutissima* also). All of these seven species should be met with in one season by anyone wishing to collect and study the group.

XLIV.—*A new Rat of the Genus Mylomys from the Upper Nile.* By OLDFIELD THOMAS.

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AMONG some Mammalia collected by Major Cuthbert Christy during his recent expedition to the Bahr-el-Ghazal, and presented by him to the National Museum, there occur two specimens of a new *Mylomys*, which may be called

Mylomys christyi, sp. n.

Size comparatively small. Under surface white, as in the large species *M. alberti*.

Size rather smaller than in *M. cunninghami*, the smallest of the described species. Colour above strongly lined pale buffy and black with ochraceous rump, the general effect paler than in *lutescens* and less ochraceous than in *alberti*. Sides more creamy buff. Under surface white, the hairs white to their roots in the type, but with a little pale slaty at the bases of the hairs in the paratype, which is, however, rather immature. Sides of nose, a line above eye, and back of ears ochraceous. Hands and feet grizzled yellow. Tail well-haired, dark brown above, buffy yellow on sides and below.

Skull rather smaller than that of *M. cunninghami*, but similar in general form. Palatal foramina comparatively narrow, not widely open as in *lutescens*. Bullæ rather small. Molars larger than those of *cunninghami*, but not equalling those of *lutescens*.

Dimensions of the type (measured by the collector in the flesh):—

Head and body 135 mm.; tail 140; hind foot 34; ear 19.

Skull: greatest length 33.5; condylo-incisive length 31.6; zygomatic breadth 16.4; nasals 13.2; interorbital breadth 4.5; palatal foramina 7.1×2.1 ; upper molar series 7.3; breadth of m^1 2.5.

Hab. Mt. Baginzi, Bahr-el-Ghazal. Alt. 3500'.

Type. Adult female. B.M. no. 17.10.4.17. Original number 29. Collected March 1916, and presented by Major Cuthbert Christy, R.A.M.C. Two specimens.

Mylomys cunninghami of British East Africa and *M. lutescens* of Uganda have the belly hairs broadly plumbeous basally. *M. alberti* of the Upper Welle is conspicuously larger than *M. christyi*, the skull 38.5 mm. in length. "*Pelomys*" *roosevelti*, Heller, which is clearly a *Mylomys*, I do not know, but its molars are said to be 8.5 mm. in length.

XLV.—*Descriptions of new Fishes from Lake Tanganyika forming Part of the Collection made by the late Dr. L. Stappers for the Belgian Government.* By G. A. BOULENGER, F.R.S.

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A REPORT on the large collection of Fishes made by Dr. L. Stappers* in Lake Tanganyika and other parts of the Belgian Congo was in preparation when the war broke out, and only the greater part of the diagnoses of the new species have so far been published in Brussels†. I now propose, after this long delay, to give short descriptions of the remainder, so as to render the whole series available for reference.

Alestes vittatus.

Depth of body $3\frac{1}{2}$ to $3\frac{2}{3}$ times in total length, length of head 4 to $4\frac{1}{4}$ times. Head twice as long as broad, a little longer than deep; snout as long as eye, which is 3 times in

* On his return to Europe, hastened by the outbreak of the war, Dr. Stappers joined the Medical Service of the Belgian Army; he died in hospital at Calais on Dec. 30, 1916. The death of this promising young zoologist is a great loss to Science.

† Rev. Zool. Afr. iii. 1914, pp. 442-447, and iv. 1915, pp. 162-170. The Acanthopterygii and Opisthomi are included in the British Museum Catalogue of African Fishes.

length of head; adipose eyelid feebly developed; interorbital width $2\frac{1}{2}$ to $2\frac{3}{4}$ times in length of head. Gill-rakers thin and rather short, 12 or 13 on lower part of anterior arch. Dorsal II 8, originating above inner ray of ventral, at equal distance from end of snout and from caudal; longest ray nearly as long as head. Anal III 15-16. Pectoral not reaching ventral. Caudal peduncle a little longer than deep. Scales 23-24 $\frac{1}{2}$, 2 between lateral line and ventral. Silvery: a blackish lateral band, widening from the gill-cover to below the dorsal.

Total length 80 mm.

Lufuko River at Pala.

Near *A. kingsleya*, Gthr., but dorsal a little further back, fewer gill-rakers, and lateral band complete.

Varicorhinus stappersii.

Depth of body $3\frac{1}{2}$ to $3\frac{3}{4}$ times in total length, length of head $4\frac{1}{2}$ to 5 times. Snout rounded, broader than long, $\frac{1}{3}$ length of head; eye supero-lateral, 5 times in length of head, 2 to $2\frac{1}{2}$ times in interorbital width; mouth very feebly curved, its width $\frac{1}{2}$ length of head; 2 barbels on each side, anterior as long as eye, posterior $1\frac{1}{2}$ as long. Dorsal III 9, equally distant from centre of eye and from caudal; last simple ray strong, bony, not serrated, its stiff portion measuring a little more than $\frac{1}{2}$, or nearly $\frac{2}{3}$, length of head. Anal II 5. Pectoral not reaching ventral, which is inserted below anterior rays of dorsal. Caudal peduncle $1\frac{2}{3}$ to nearly 2 times as long as deep. Scales 30-31 $\frac{1}{2}$, $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Brown above, whitish beneath, the demarcation line passing through the middle of the series of scales below the lateral line.

Total length 300 mm.

Lufuko River at Nganza.

Near *V. brachii*, Bigr., but mouth wider and barbels longer.

Barbus tæniopleura.

Depth of body $3\frac{1}{2}$ to $3\frac{3}{4}$ times in total length, length of head 4 to $4\frac{1}{2}$ times. Snout rounded, as long as eye, which is $3\frac{1}{3}$ to $3\frac{1}{2}$ times in length of head; interorbital width $2\frac{1}{2}$ times in length of head; mouth small, subinferior; lips feebly developed; 2 barbels on each side, anterior $1\frac{1}{3}$ to $1\frac{2}{3}$ times diameter of eye, posterior $1\frac{1}{2}$ to 2 times. Dorsal III 8, equally distant from centre of eye and from caudal, border very feebly notched, last simple ray flexible, as long

as head. Anal III 5, not reaching caudal. Pectoral as long as head or a little shorter, not reaching ventral, which is inserted below anterior rays of dorsal. Caudal peduncle $1\frac{2}{3}$ to 2 times as long as deep. Scales with numerous radiating striae, 27-29 $\frac{1}{2}$, $2\frac{1}{2}$ between lateral line and ventral, 12 round caudal peduncle. Brownish above, yellow beneath; a narrow blackish lateral band from the gill-cover to the root of the caudal; fins whitish.

Total length 80 mm.

Kasarala brook at Gongwe.

Near *B. chlorotenia*, Blgr., but caudal peduncle more elongate.

Barbus urostigma.

Depth of body equal to length of head, $3\frac{1}{3}$ to $3\frac{2}{3}$ times in total length. Snout rounded, as long as eye, which is $3\frac{1}{3}$ to $3\frac{2}{3}$ times in length of head; interorbital width $2\frac{1}{2}$ times in length of head; mouth small, subinferior; lips feebly developed; 2 barbels on each side, anterior as long as eye or a little longer, posterior $1\frac{1}{2}$ to $1\frac{1}{2}$ times its length (barbels shorter in the young). Dorsal III 7, equally distant from centre or posterior border of eye and from caudal, border straight or slightly convex; last simple ray flexible, as long as head or a little shorter. Anal III 5, not reaching caudal. Pectoral $\frac{2}{3}$ to $\frac{3}{4}$ length of head, not reaching ventral, which is inserted below anterior rays of dorsal. Caudal peduncle $1\frac{1}{2}$ to 2 times as long as deep. Scales with numerous radiating striae, 25-30 $\frac{1}{4}$, $2\frac{1}{2}$ -3 between lateral line and ventral, 12 round caudal peduncle. Brown above, whitish beneath, the scales on the side often edged with dark brown, or blackish at the base; a round black spot at base of caudal; fins whitish.

Total length 70 mm.

Brooks at Mazonde, Kibudwe, and Gongwe.

Distinguished from the preceding by the shape of the dorsal, with 7 branched rays instead of 8, and by the absence of the blackish lateral band.

Barbus tufukiensis.

Depth of body equal to length of head, $3\frac{1}{2}$ to $3\frac{2}{3}$ times in total length. Snout rounded, as long as eye, which is 3 to $3\frac{1}{3}$ times in length of head; interorbital width $2\frac{1}{2}$ to $2\frac{2}{3}$ times in length of head; mouth small, subinferior; lips feebly developed; 2 barbels on each side, anterior hardly

$\frac{1}{2}$ length of eye, posterior $\frac{2}{3}$ (less still in the young). Dorsal III 7, equally distant from eye and from caudal, with concave border; last simple ray flexible, as long as head. Anal II 5, not reaching caudal. Pectoral nearly $\frac{2}{3}$ length of head, not reaching ventral, which is inserted below anterior rays of dorsal. Caudal peduncle $1\frac{1}{2}$ times as long as deep. Scales with few radiating striæ, 24–25 $\frac{3\frac{1}{2}}{2\frac{1}{2}}$, $1\frac{1}{2}$ between lateral line and ventral, 8 round caudal peduncle; the exposed part of the scales of the lateral line nearly 3 times as deep as long. Brownish, the scales on the side edged with dark brown; fins whitish.

Total length 110 mm.

Lufuko River at Pala.

Near *B. congicus*, Blgr., but dorsal with 7 branched rays instead of 8.

Chrysichthys stappersii.

Depth of body $4\frac{1}{4}$ times in total length, length of head $3\frac{3}{4}$ times. Head much flattened, $1\frac{1}{3}$ times as long as broad, rugose above; occipital process in contact with interneural shield; snout broadly rounded, projecting very feebly beyond mouth; eye $6\frac{1}{4}$ times in length of head and $2\frac{1}{3}$ times in interocular width; width of mouth $1\frac{2}{3}$ times in length of head; band of premaxillary teeth curved, 7 times as long as broad; vomero-ptyergoid teeth in a long uninterrupted band, very broad on the sides. Nasal barbel nearly as long as eye, maxillary $1\frac{1}{3}$ times length of head, outer mandibular $\frac{2}{3}$ length of head. Gill-rakers moderately long, 10 on lower part of anterior arch. Dorsal I 6, its distance from caudal $1\frac{1}{3}$ times its distance from end of snout; spine striated, a little less than half length of head; second branched ray longest, a little more than half length of head. Adipose dorsal 3 times as long as deep, $1\frac{1}{3}$ times as long as rayed dorsal, from which it is separated by a space a little greater than its base. Anal IV 9. Pectoral spine $\frac{1}{2}$ length of head, strongly serrated on inner side. Caudal forked, longest rays $3\frac{1}{2}$ times as long as median. Caudal peduncle nearly twice as long as deep. Brown above, white beneath.

Total length 430 mm.

Kilewa Bay.

Near *C. cranchii*, Leach, but mandibular barbels longer, adipose fin larger, caudal more deeply notched.

Chrysichthys grandis.

Depth of body 4 to $4\frac{3}{4}$ times in total length, length of head 3 to $3\frac{1}{4}$ times. Head much flattened, as long as broad, smooth; occipital process in contact with interneural shield; snout broadly rounded, projecting very feebly beyond mouth; eye $8\frac{1}{2}$ to 10 times in length of head and $3\frac{2}{3}$ to 5 times in interocular width; width of mouth $1\frac{1}{2}$ times in length of head; band of premaxillary teeth feebly curved, $7\frac{1}{2}$ to 8 times as long as broad; vomero-ptyergoid teeth in a long and rather broad band narrowly interrupted in the middle. Nasal barbel $1\frac{1}{2}$ to $1\frac{2}{3}$ times diameter of eye, maxillary barbel $\frac{1}{2}$ to $\frac{2}{3}$ length of head, outer mandibular $\frac{1}{4}$. Gill-rakers moderately long, 11 or 12 on lower part of anterior arch. Dorsal I 6, equally distant from end of snout and from caudal; spine small, smooth, about $\frac{1}{4}$ length of head. Adipose dorsal twice as long as deep, as long as or a little shorter than rayed dorsal, from which it is separated by a space $2\frac{1}{4}$ to 3 times its length. Anal IV 8. Pectoral spine $\frac{1}{4}$ to $\frac{1}{3}$ length of head, feebly serrated on inner side. Caudal notched, with rounded lobes, longest rays about twice as long as median. Caudal peduncle hardly $1\frac{1}{2}$ times as long as deep. Dark brown; belly white.

Total length 570 mm.

Kilewa Bay.

Near *C. myriodon*, Blgr., but head smooth, band of teeth on the palate narrower on the sides, nasal barbel longer, dorsal and pectoral spines shorter.

Synodontis dhonti.

Depth of body equal to length of head, $3\frac{1}{4}$ times in total length. Head $1\frac{1}{4}$ times as long as broad, with strong granular asperities between and behind the eyes; snout obtusely pointed, a little longer than postocular part of head; eye supero-lateral, $9\frac{1}{2}$ times in length of head, $3\frac{1}{2}$ times in interorbital width; lips moderately developed; mandibular teeth $\frac{1}{3}$ diameter of eye, 20 in number, forming a transverse series. Maxillary barbel not margined, nearly $\frac{2}{3}$ length of head; mandibular barbels with few and slender branches. Nuchal shield tectiform and very rugose like the occiput, a little longer than broad, with obtuse posterior processes. Humeral process rugose, granular, not keeled, twice as long as broad, rounded. Dorsal I 7; spine strong, finely striated, serrated behind. Adipose dorsal low, 5 times as long as

deep, nearly twice as long as its distance from rayed dorsal. Anal III 8, rounded. Pectoral spine strong, nearly $\frac{3}{4}$ length of head, with strong serræ on inner side only. Caudal peduncle as long as deep. Brown above and beneath; caudal yellowish, blackish on the outer rays.

Total length 360 mm.

Kilewa Bay.

Holds an isolated position in the genus, but perhaps nearer to *S. granulatus*, Blgr., than to any other species.

Named after M. G. Dhont-De Bie, who accompanied Dr. Stappers on his expedition.

XLVI.—A Note on the Coleopterous Genus *Euxestus*.

By GILBERT J. ARROW.

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IN a recent paper in this Magazine upon the African representatives of the Erotylidæ (see p. 138 of the present volume) I sank Motschulsky's genus *Tritomidea* as a synonym of the well-known and almost universally distributed *Euxestus*. Although unable to decide with any degree of certainty upon the status of the three species from Ceylon and India placed by Motschulsky in *Tritomidea*, I ventured to express a belief that *T. translucida*, the only one of the three of which a formal description was given, would prove to be identical with the widespread *Euxestus parki*, Woll. At the time of writing, I had not examined the abundant series of these insects collected in Ceylon by Mr. George Lewis but, having since discovered these, I have been able to recognize two species which are evidently those called *Tritomidea translucida* and *basalis* by Motschulsky, and of these the second, and not the first, proves to be *Euxestus parki*, while *T. translucida* is a well-marked species of the same genus previously unknown to me. It is larger and relatively broader than *E. parki* and can generally be recognized at once by the occurrence of three rather inconstant blood-red patches placed in a triangle upon the elytra—one at the base of each and the third upon the suture.

Motschulsky's third form, *Tritomidea oblonga* ("from the Indian continent"), is apparently very similar to the African species I have named *Euxestus angustus*.

XLVII.—*Descriptions of New Pyralidæ of the Subfamily Pyraustinæ.* By Sir GEORGE F. HAMPSON, Bart., F.Z.S., &c.

PYRAUSTINÆ.

(4a) *Neurophyseta fulvistrigalis*, sp. n.

♂. Head, thorax, and abdomen silvery white, the last with black band on 2nd segment; antennæ fulvous; fore tibiæ and tarsi blackish in front. Fore wing silvery white; the costa black towards base; small subbasal black spots at costa and below the cell; antemedial line black, oblique at costa and dilated into slight spots below costa and at vein 1, interrupted below costa by a fulvous yellow streak extending to the postmedial line; an oblique black discoidal bar with whitish striga in centre; postmedial line black, obliquely curved to vein 3 where there is a blackish spot on its inner side, then strongly incurved, somewhat diffused and waved below vein 2, a black line beyond it to vein 3, somewhat divergent at costa and vein 3; the costa blackish towards apex; a blackish line from apex somewhat incurved and rather strong below apex, then slight and extending just before termen to vein 3. Hind wing silvery white; a blackish postmedial line, slight and excurved to vein 3, then stronger and excurved below vein 2.

Hab. PERU, Carabaya, Oconeque (*Ockenden*), 2 ♂ type. *Exp.* 22 mm.

(4c) *Neurophyseta disciatralis*, sp. n.

♀. Head, thorax, and abdomen silvery white, the last with dorsal black band on 2nd segment and bar on 3rd segment; fore tibiæ black above, the tarsi tinged with cupreous brown towards base. Fore wing silvery white; a black point at base of costa and minute black spot on vein 1 near base; subbasal black striæ on and below costa with an orange bar between them; short antemedial black streaks on and below costa with an oblique pale orange bar between them and a slight erect blackish line from below them to vein 1; an elliptical black-brown discoidal spot with some silvery white in centre, a diffused orange streak from above it just below costa to the postmedial line, some diffused black-brown and orange beyond it to the postmedial line and a black-brown patch before the postmedial line from vein 5 to below 3; postmedial line blackish, excurved to vein 3, then incurved, slight and slightly waved below vein 2, a blackish line beyond it from costa to vein 2, somewhat divergent at costa and vein 2; a black line from apex, incurved and with a faint orange tinge beyond it below apex, then faint to vein 3. Hind wing

silvery white; a slight brown antemedial line from cell to inner margin; a slight postmedial line, rather inwardly oblique to vein 2, then excurved; a faint subterminal line from vein 6 to tornus.

Hab. PERU, Carabaya, Oconeque (*Ockenden*), 1 ♀ type. *Exp.* 22 mm.

(11 a) *Neurophyseta mesophæalis*, sp. n.

♂. Head, thorax, and base of abdomen silvery white, the metathorax with yellowish and blackish patch, the rest of abdomen ochreous irrorated with black except towards extremity; antennæ pale ochreous with slight blackish rings; pectus, legs, and ventral surface of abdomen white tinged with ochreous, the fore femora and tibiæ suffused with black. Fore wing silvery white, the medial area black-brown with an orange fascia below costa and slight streak on vein 7, the terminal area with a black-brown patch at middle; an orange and fulvous patch at base of costa; an oblique and silvery whitish discoidal bar tinged with brown and defined by black; postmedial line black-brown defined on inner side by white and rather obliquely excurved to vein 3, then represented by the oblique edge of the dark medial area; a fine dark brown line from apex, slightly incurved and with some gold beyond it just below apex, then slight to vein 2 just before termen; cilia dark brown between veins 5 and 2. Hind wing silvery white; a slight brownish discoidal lunule; postmedial line indistinct, brownish, excurved to vein 3 and below vein 2, with a dark streak before it on vein 1 with some brownish suffusion above it; a slight brown terminal line; cilia with some reddish brown mixed.

Hab. PERU, San Domingo (*Ockenden*), 1 ♂ type. *Exp.* 16 mm.

(12 b) *Neurophyseta fulvilinealis*, sp. n.

♀. Head and thorax silvery white; abdomen white tinged with brownish ochreous. Fore wing silvery white; a patch of pale fulvous yellow suffusion on costa near base; antemedial line faint, pale fulvous yellow, curved; an oblique white discoidal lunule defined by black, obsolescent below, some pale fulvous yellow above it on costa and short streaks beyond it on veins 7, 6; postmedial line pale fulvous yellow, straight and erect to vein 3 with traces of a brownish line beyond it, then rather diffused, retracted to lower angle of cell and erect to inner margin; a fine black line from apex, slightly incurved and with some fulvous yellow beyond it below apex, then very faint to vein 2 just before termen. Hind wing silvery white; curved fulvous yellow ante- and postmedial lines and a faint subterminal line; a slight brown striga from costa before apex with some yellow beyond it and the termen yellowish towards tornus.

Hab. COLOMBIA, Choko Province, Condoto (*Spurrell*), 1 ♀ type. *Exp.* 16 mm.

(14b) *Neurophyseta flavirufalis*, sp. n.

♀. Head and thorax orange, the patagia with rufous patch near base; abdomen orange-yellow suffused with rufous except towards base; antennæ orange-yellow with slight blackish rings; palpi irrorated with rufous; pectus, legs, and ventral surface of abdomen orange-yellow, the fore femora and fore and mid tibiæ suffused with black. Fore wing orange; a small red-brown spot at base of costa; a broad diffused deep rufous antemedial band from costa to above inner margin; two rather diffused rufous lines from middle of costa, then a deep rufous band, sinuous to vein 1, then bent inwards; a dark brown discoidal lunule; a broad rufous shade before the postmedial line, almost confluent with the medial band below the cell, the line orange defined on outer side by rufous patches at middle and on inner area, slightly incurved at discal fold, excurved to vein 3, then strongly incurved and angled outwards at vein 1, some red-brown beyond it on costa; subterminal line dark red-brown, excurved at discal fold and interrupted in submedian interspace, some rufous suffusion beyond it except at discal and submedian folds; cilia white, dark brown except at base towards apex and tornus and between veins 5 and 2. Hind wing silvery white with some rufous and yellowish on terminal area at vein 2.

Hab. PERU, Carabaya, Oconeque (*Ockenden*), 1 ♀ type. *Exp.* 24 mm.

(3) *Catapsêphis subterminalis*, sp. n.

♂. Head and tegulæ black-brown with a small white spot on vertex of head; thorax and abdomen silvery white, the latter with black-brown band on 2nd segment; antennæ white except the basal joint; palpi black with some white on 2nd joint in front and at extremity of 3rd joint; maxillary palpi ringed black and white; pectus, legs, and ventral surface of abdomen silvery white, the fore coxæ and femora in front and tibiæ below black-brown. Fore wing silvery white; a small subbasal black spot on costa; a red-brown point at middle of costa; reniform defined by black except above; a patch of reddish-brown suffusion beyond the cell between veins 7 and 3; postmedial line brown defined on outer side by white, straight and erect to vein 5, excurved to vein 3, then pale red-brown and retracted to below end of cell and oblique and sinuous to inner margin, a broad dark reddish brown band beyond it, narrowing to the costa; subterminal line black-brown, arising from apex, incurved and with a dark brown spot on its outer side below apex, then excurved and interrupted by brown fasciæ from the broad band between veins 5 and 3 and at vein 2; cilia with a forked black-brown mark at apex and black spots at veins 4 and 2. Hind wing silvery white; a black discoidal spot; a broad reddish-

brown postmedial band from costa to vein 2, then narrow, faint, and yellow-brown and incurved to termen at vein 1, emitting fasciæ to the termen and cilia between veins 5 and 3 and at vein 2; subterminal line black, interrupted at the fasciæ and incurved between them, then sinuous and ending at submedian fold; cilia with a forked dark reddish-brown mark below apex.

Hab. New Georgia (*Meek*), 1 ♂ type. *Exp.* 16 mm.

(4) *Catapsephis flavizonalis*, sp. n.

♀. Head and shoulders black-brown with a white patch on vertex of head; thorax white; abdomen orange-yellow at base, then white tinged with brown; antennæ white; frons with white spot; palpi black with some white on 2nd joint in front and at base and extremity of 3rd joint; maxillary palpi black ringed with white; pectus and legs pale orange-yellow, the fore tibiæ and the tarsi white. Fore wing silvery white; a small dark brown and orange-yellow spot on costa near base; an oblique orange-yellow antemedial band from below costa to inner margin; a black point at middle of costa with orange-yellow line from it to inner margin; black striæ on each side of discocellulars; a broad orange-yellow band beyond the cell, arising at vein 7 and bent inwards along median nervure to the medial line with which it is confluent to inner margin; a small black postmedial spot on costa and a line defining the outer edge of the orange band from vein 6 to submedian fold with a small white spot on its inner side at discal fold; the postmedial area with a broad black-brown band arising at vein 6 and with some orange-yellow above it below the costa, confluent with the postmedial line at middle and incurved below vein 3; a black subterminal line arising from apex, incurved below apex and emitting a streak to the cilia, then incurved, with a dark patch on its outer side at middle emitting fasciæ to the cilia at veins 4, 3, 2. Hind wing silvery white; a narrow orange-yellow antemedial band; a black discoidal bar; a broad orange-yellow postmedial band, its outer edge excurved beyond the cell; an orange-yellow subterminal band irrorated with fuscous on costal half, its edges slightly sinuous, incurved below vein 3 and ending on termen at vein 1; a black line before termen, slightly angled outwards at vein 3 and ending at submedian fold, dark patches beyond it below apex and at middle, the former emitting a streak to the cilia and the latter two, some yellow beyond it at vein 2 with a small black spot on the cilia.

Hab. DUTCH N. GUINEA, Snow Mts., Up. Setekwa R. (*Meek*), 1 ♀ type. *Exp.* 16 mm.

(5) *Catapsephis leucomelæna*, sp. n.

♂. Head and neck black-brown mixed with some white; thorax and abdomen silvery white, the latter with black band on 2nd

segment; antennæ white except the basal joint; palpi black-brown with some white in front of 2nd joint and at extremity of 3rd joint; maxillary palpi banded black-brown and white; legs tinged with red-brown, the fore femora towards extremity and tibiæ below black-brown. Fore wing silvery white; a black-brown subbasal spot on costa, point at middle of costa and postmedial striga from costa; reniform defined by black-brown except above; the area beyond the cell blackish with a red-brown tinge except the costal area to beyond the postmedial striga, its inner edge sinuous; a black-brown terminal line except between veins 4 and 2, dilated into a patch below apex and defined on inner side by white towards apex and at discal and submedian folds; cilia white with black-brown patches at apex and middle and fasciæ at veins 6 and 2. Hind wing silvery white; a small black discoidal spot; a broad blackish subterminal band tinged with red-brown from costa to vein 2, emitting a patch to the termen and cilia at middle and streak at vein 2; a black terminal line except towards tornus, interrupted at the patch and streak and defined on inner side by white except at those points; cilia with a forked black-brown patch at apex.

Hab. SOLOMON Is., Choiseul I. (*Meek*), 1 ♂ type. *Exp.* 20 mm.

(2*b*) *Sufetula brunnealis*, sp. n.

♀. Head, thorax, and abdomen dark red-brown slightly mixed with whitish; palpi with the 3rd joint white with black ring near tips; maxillary palpi white at tips; pectus, legs, and ventral surface of abdomen white suffused with red-brown, the fore legs darker brown, the tarsi ringed with white. Fore wing dark red-brown; antemedial line black defined on inner side by white, slightly angled outwards below costa and at submedian fold; the medial part of costa with alternating white and black-brown points; a white discoidal bar defined on inner side by black; postmedial line white, defined on outer side by blackish towards costa and arising from costa towards apex, rather oblique to vein 5, then very inwardly oblique, sinuous and incurved at vein 2; cilia black at base, white at tips. Hind wing dark reddish brown; a curved whitish medial line from discal fold to inner margin near tornus; subterminal line white defined on inner side by black-brown, sinuous, excurved at middle and submedian fold and ending on termen at vein 1; a terminal series of small black spots; cilia white at base, black-brown at tips.

Hab. PHILIPPINES, Manila (*Ledyard*), 1 ♀ type. *Exp.* 18 mm.

(7*a*) *Massepha grisealis*, sp. n.

♂. Head, thorax, and abdomen glossy grey-brown; antennæ whitish ringed with brown; frons white, brown at sides; palpi

brown, the base and 3rd joint white; pectus and legs white suffused with brown; ventral surface of abdomen banded white and brown. Fore wing narrow, glossy grey-brown; traces of an antemedial brown line; a dark brown discoidal bar with whitish patch beyond it; a small postmedial black spot on costa with some whitish before and beyond it, then traces of a brown postmedial line excurred beyond the cell then incurved to origin of vein 2; the costal edge dark towards apex; a fine dark terminal line and pale line at base of cilia. Hind wing glossy grey-brown; a dark discoidal bar and postmedial line from costa to vein 3; a fine whitish line at base of cilia followed by a dark line.

Hab. GOLD COAST, Bibianaha (Spurrell), 1 ♂, Kumasi (Sanders), 1 ♂ type. *Exp.* 18 mm.

Genus ENTEPHRIA.

Entephria, Led. Wien. Ent. Mon. 1863, p. 428, nec Hübner. Verz. p. 331 (1827), will stand as

Pycnarmon, Led. Wien. Ent. Mon. 1863, p. 442.

Type, *jaguaralis*.

(5c) *Pycnarmon dialithalis*, sp. n.

♀. Head, thorax, and abdomen yellow sparsely irrorated with red; palpi banded with red. Fore wing yellow suffused and mottled with red and with traces of ante- and postmedial lines. Hind wing yellow; a diffused obliquely curved red band from costa before middle to tornus; a diffused oblique red band from costa beyond middle to termen at vein 1; a diffused terminal band from apex to vein 2, angled inwards below costa; cilia yellow with a red line near base. Underside of fore wing suffused with deep red; a small black spot in cell towards extremity and small discoidal lunule; ante- and postmedial white patches on costa; an elongate wedge-shaped white mark from termen below vein 7, extending at termen to below vein 6; a postmedial white band from vein 5 to below 2 angled outwards to termen at vein 5 and forming a rectangular mark; hind wing as above but with the ground-colour white and the red bands deeper in colour.

Hab. GOLD COAST, Kumasi (Whiteside), 1 ♀ type. *Exp.* 16 mm.

(6a) *Pycnarmon peruvialis*, sp. n.

Head, thorax, and abdomen white, the last with small subdorsal black spots on 3rd segment, the penultimate segment orange-yellow with small subdorsal black spots at base, and the claspers and genital tufts orange-yellow; palpi with the 1st joint and base of 2nd behind black; fore legs with black bands at extremities of

femora and tibiae. Fore wing silvery white; small black-brown spots on costa at and near base, the latter followed by three or four minute spots on costa; an antemedial black point in the cell and discoidal striga, the latter with a slight black-brown annulus above it on costa; a faint brownish ochreous line from origin of vein 2 to inner margin; a brownish ochreous shade beyond the cell; post-medial line ochreous brown with two black-brown striæ at costa, straight and erect to vein 4, then obsolete to submedian fold and oblique to inner margin; a black point at apex, elliptical brownish ochreous patch on termen from apex to below vein 4 and black striga before termen at vein 3; cilia tinged with ochreous brown except at base. Hind wing silvery white; a black discoidal bar; post-medial line with black spot at costa, then brownish ochreous, straight to vein 4 where it is bent inwards and obsolescent, then sinuous to inner margin; a blackish striga on vein 3 before termen; a slight ochreous brown terminal line.

Ab. 1. Fore wing with the basal and subbasal black spots on costa more developed but without the minute spots beyond the latter, a minute spot above inner margin near base, the discoidal mark an elliptical spot without the ochreous shade beyond it, the ochreous postmedial line diffused, the patch on termen not extending below vein 6; hind wing with black discoidal spot.

Ab. 2. Palpi with black band at extremity of 2nd joint; abdomen without the black spots; fore wing without the minute black spots beyond the subbasal spot on costa, the spot in cell and discoidal spot ochreous brown, no ochreous shade beyond the cell.

Hab. PERU, Yahuar Mayo, 2 ♂ type, San Domingo (*Ockenden*), 3 ♂, 1 ♀, La Oroya (*Ockenden*), 1 ♀. *Exp.* 22-26 mm.

(17 b) *Pycnarmon diffusalis*, sp. n.

♂. Head and thorax white, the tegulae dorsally and patagia at base with black-brown spots glossed with cupreous; abdomen white with diffused cupreous brown bands; pectus, legs, and ventral surface of abdomen white, the fore legs tinged with cupreous brown, the tibiae darker. Fore wing silvery white; black-brown spots below costa at base and before middle and a subbasal spot below the cell conjoined to a spot above inner margin; a black-brown spot in end of cell and spot below origin of vein 2; diffused dark cupreous brown postmedial patches below costa and beyond the cell, a patch beyond lower angle of cell between veins 5 and 2 and an elongate patch on inner area conjoined to the spot below vein 2; a black-brown spot below costa beyond the postmedial patches with an oblique dark cupreous brown patch from below it at vein 7 to medial part of termen with a band from it to tornus; cilia dark cupreous brown from vein 4 to tornus. Hind wing white tinged with cupreous brown except the cell and basal costal area.

Hab. BR. C. AFRICA, Mt. Mlange (*Neave*), 2 ♂ type. *Exp.* 14-16 mm.

(3a) *Tabidia fuscifusalis*, sp. n.

Antennæ of male with long cilia; fore wing with tuft of long hair from inner margin near base; hind wing on upperside with some rough scaling in the cell and long hairs in the folds, the underside clothed with rough hair.

♂. Head, thorax, and abdomen whitish suffused with reddish brown; antennæ fuscous brown; palpi, pectus, legs, and ventral surface of abdomen white tinged with reddish brown. Fore wing white with a brownish tinge: the costal edge fuscous towards base and with dark subbasal and antemedial bars from costa, the basal area suffused with dark reddish brown below subcostal nervure; a black spot in middle of cell and elliptical discoidal spot; a broad rather diffused black-brown band beyond the cell, interrupted by a forked whitish streak on veins 5, 4 and oblique below vein 4, its outer edge conjoined to a black-brown subterminal spot between veins 5 and 3; a black-brown terminal line except at apex. Hind wing whitish suffused with reddish brown, the terminal area broadly black-brown, the costal area whitish towards base; an oblique black-brown discoidal bar; cilia white.

Hab. CEYLON, Ratnapura (*Mackwood*), 1 ♂ type. *Exp.* 22 mm.

(6a) *Agrotera rufitinctalis*, sp. n.

♀. Head, thorax, and abdomen whitish suffused with rufous; pectus, legs, and ventral surface of abdomen white tinged with rufous, the fore tarsi black at extremities. Fore wing whitish suffused with pale red-brown with a cupreous gloss; the basal area whiter with some slight pale fiery red marks on it: antemedial line black, somewhat oblique and sinuous, a small black spot just beyond it in the cell and black discoidal bar; postmedial line black-brown, recurved below costa, slightly incurved at discal fold, bent inwards below vein 3 and excurved at submedian fold, the area beyond it suffused with dark brown except towards costa; a black terminal line; cilia white, black-brown at apex, middle, and tornus. Hind wing white, the area from lower angle of cell to termen at apex and vein 2 suffused with pale red-brown with a cupreous gloss; an oblique blackish discoidal bar and oblique bar below origin of vein 2; postmedial line blackish, slightly incurved at discal fold, then oblique to vein 2 on which it is retracted, then excurved to above tornus; a black terminal line; cilia white, black at tips to vein 2.

Hab. BR. C. AFRICA, Mt. Mlanje (*Neave*), 1 ♀ type. *Exp.* 24 mm.

(11c) *Desmia albitarsalis*, sp. n.

♂. Head, thorax, and abdomen black-brown with a slight leaden gloss; palpi with the basal joint and the throat white;

coxae with white patches; tarsi white, the fore tarsi brown at extremities, the mid and hind tarsi with the basal joint brown; ventral surface of abdomen with the basal segments white. Fore wing black-brown with a cupreous gloss; a round white spot in middle of cell and conjoined rather elliptical spots in and below the cell before extremity; a postmedial series of five small conjoined white spots between veins 8 and 3, incurved below vein 7; cilia whitish and brown with a black line near base. Hind wing black-brown with a cupreous tinge; a white discoidal bar; cilia whitish and brown with a black line near base.

Hab. VENEZUELA, Esteban Valley, Las Quiguas, 1 ♂ type. *Exp.* 22 mm.

(13 a) *Pagyda retractilinea*, sp. n.

♀. Head, thorax, and abdomen white; palpi tinged with golden brown except in front. Fore wing white, the costal and terminal areas with a faint ochreous tinge; a curved yellow-brown antemedial line; a slight brown mark in middle of cell and discoidal bar; postmedial line yellow-brown, rather oblique to vein 5, then erect to below vein 3, then retracted to lower angle of cell and rather oblique to inner margin; a curved rather indistinct and diffused yellow-brown subterminal line, somewhat dentate between veins 6 and 2; a fine yellow-brown terminal line. Hind wing white, the terminal area with a faint ochreous tinge; postmedial line yellow-brown, straight and erect to below vein 3, then retracted to lower angle of cell and rather oblique to inner margin; a curved yellow-brown subterminal line, incurved at vein 3 to the angle of the postmedial line and ending at tornus; a fine yellow-brown terminal line except towards tornus; cilia tinged with yellow except at tips.

Hab. BR. E. AFRICA, Nairobi (*Anderson*), 1 ♀ type. *Exp.* 22 mm.

(18 a) *Pagyda atriplagiata*, sp. n.

♂. Head, thorax, and abdomen ochreous white; the tegulae dorsally and patagia at base with black-brown spots, the patagia at extremities black-brown and the dorsum of thorax suffused with black-brown; abdomen dorsally suffused with black on medial segments and at extremity; palpi with the 2nd joint black-brown behind; fore tibiae with black bands at extremity and the tarsi ringed with black. Fore wing ochreous yellow; a rather broad black-brown band near base and almost medial band somewhat dilated above inner margin; a black-brown discoidal bar; a wedge-shaped postmedial black-brown patch from costa to discal fold and a rather conical patch from vein 4 to inner margin near tornus; a rather elliptical black-brown band from apex to vein 4 before termen; a fine black terminal line from apex to vein 6; cilia brown except at base towards apex. Hind wing ochreous white; a black

point on upper discocellular and small spot above middle of inner margin; a postmedial dark striga between veins 6 and 5; a black subterminal line between veins 7 and 4 and a rather oblique band from vein 3 to submedian fold; cilia yellow at base, silvery white at tips.

♀. Abdomen without the black patches; fore wing with the medial band conjoined to the discoidal bar; hind wing without the dark postmedial striga.

Hab. BR. N. GUINEA, Kumusi R. (*Meek*), 1 ♂, 1 ♀ type. *Exp.* 20 mm.

(3 a) *Marasmia euryterminalis*, sp. n.

♂. Head, thorax, and abdomen glossy red-brown, the last with small subdorsal black spots on penultimate segment and subdorsal white fasciæ on anal segment; antennæ whitish ringed with dark brown; frons with white lines at sides; palpi white at base; pectus, legs, and ventral surface of abdomen white tinged with red-brown, the fore tibiæ dark cupreous brown. Fore wing glossy red-brown slightly irrorated with dark brown; a blackish antemedial line from cell to inner margin; the medial part of costa with series of black points with whitish between them; postmedial line blackish defined on outer side by whitish, broadly below the cell, dilated into a small spot at costa, inwardly oblique to vein 4, then retracted to lower angle of cell and again oblique to inner margin; the terminal area broadly darker brown; a slight dark terminal line; cilia ochreous white with a black line near base. Hind wing with the basal half white tinged with reddish brown; a blackish discoidal bar; postmedial line black-brown rather broadly defined on outer side by white, rather oblique to vein 3, then retracted to below angle of cell and oblique to inner margin near tornus, a dark brown shade beyond it shading to paler reddish brown at termen; a slight dark terminal line and blackish mark at tornus; cilia ochreous white with a blackish line near base.

♀. Fore wing with black discoidal bar.

Hab. FORMOSA, Kanshrei (*Wileman*), 1 ♀; ASSAM, Khásis, 1 ♂ type. *Exp.* 20 mm.

(9 a) *Marasmia brunneofusalis*, sp. n.

♀. Head, thorax, and abdomen reddish brown mixed with some whitish; palpi white towards base; pectus, legs, and ventral surface of abdomen white, the legs tinged with red-brown. Fore wing whitish suffused with red-brown to the postmedial line, the costal area red-brown, the terminal area brown tinged with grey; a curved blackish antemedial line rather broadly defined on inner side by whitish except at costa; postmedial line blackish rather broadly defined on outer side by whitish narrowing at costa, forming a minute black spot at costa, slightly incurved to vein 5, excurved to below vein 3, then retracted to lower angle of cell and erect to inner

margin, the whitish beyond it with a slight curved dark shade on its outer edge from below costa to below vein 3; cilia white tinged with brown and with dark brown line near base. Hind wing whitish, the terminal area brown tinged with grey; an oblique black-brown discoidal bar with oblique line from it to inner margin near tornus; a black-brown postmedial line from costa to just below vein 3; the terminal area defined on inner side by a rather diffused darker line, bent inwards at vein 3 to the postmedial line; a dark terminal line; cilia ochreous white with a dark brown line near base.

Hab. BR. C. AFRICA, Mt. Mlanje (*Neave*), 5 ♀ type. *Exp.* 18–22 mm.

(4c) *Syngamia lophoceralis*, sp. n.

♂. Head whitish and red-brown, the antennæ brownish white with the tufts glossy black-brown, the palpi reddish brown, white towards base; thorax red-brown with a greyish tinge; abdomen whitish suffused with red-brown; pectus, legs, and ventral surface of abdomen white tinged with red-brown. Fore wing glossy reddish brown mixed with some whitish and slightly irrorated with darker brown; an indistinct curved dark antemedial line; an oblique black discoidal bar; postmedial line blackish, excurved and dentate to vein 2, then retracted to below end of cell and excurved in submedian interspace; a terminal series of slight dark spots; cilia white with a dark brown line at middle. Hind wing glossy reddish brown mixed with some whitish and slightly irrorated with darker brown; a small blackish discoidal spot; postmedial line blackish defined on outer side by whitish, more distinctly on inner area, excurved to vein 2, then retracted to below end of cell and oblique to inner margin near tornus; a blackish terminal line; cilia with a yellowish line at base followed by a blackish line, the tips white.

Hab. PERU, Pozuzo, 1 ♂ type. *Exp.* 22 mm.

(4d) *Syngamia melanolopha*, sp. n.

♂. Head, thorax, and abdomen pale æneous brown, the last with diffused black segmental lines and lateral streaks on anal segment; antennæ with the tufts black; palpi white at base; pectus, legs, and ventral surface of abdomen white tinged with red-brown, the fore tibiae dark brown at extremities. Fore wing white tinged with æneous brown, the terminal area æneous brown; two rather maculate blackish antemedial lines; a black discoidal spot; postmedial line blackish defined on outer side by white, excurved and minutely dentate to vein 2, then retracted to below end of cell and rather oblique to inner margin; an indistinct dark terminal line; cilia chequered æneous brown and white. Hind wing white tinged with æneous brown; the terminal area æneous

brown; a black mark at base and spot in middle of cell with diffused oblique black line from it to inner margin; some diffused black beyond the cell; postmedial line black, rather broadly defined on outer side by white, slightly incurved to vein 2, then retracted to its origin and oblique to inner margin near tornus; a small black spot at tornus with some blackish suffusion above it; a blackish terminal line; cilia white with a blackish line at middle.

Hab. ECUADOR, Zamora, 1 ♂ type. *Exp.* 22 mm.

(5 b) *Syngamia pachyceralis*, sp. n.

Antennæ of male with the basal joint long and somewhat dilated, the shaft laminate towards base and with ridge of scales above towards base.

Head and thorax reddish brown, the extremity of patagia and metathorax white; abdomen white tinged with reddish brown; antennæ of male with the ridge of scales black; palpi white towards base; pectus, legs, and ventral surface of abdomen white, the legs faintly tinged with æneous brown. Fore wing pale æneous brown, the area below the cell from before the antemedial to beyond the postmedial line white faintly tinged with brown; some dark brown at base; a curved blackish antemedial line forming a minute spot at costa; a black discoidal bar; postmedial line blackish defined on outer side by white, forming a minute black spot at costa, very minutely waved to vein 2, then retracted to below end of cell and slightly angled outwards to vein 1; a blackish terminal line; cilia whitish with a blackish line at middle. Hind wing white to beyond the postmedial line, the terminal area pale ochreous brown; a black discoidal point; postmedial line fine, black, minutely waved between veins 5 and 2, then retracted to below end of cell, excurved at submedian fold and oblique to inner margin; a dark terminal line and diffused blackish mark at tornus; cilia white with a dark line at middle.

Hab. PANAMA, Obispo, 1 ♂, 1 ♀ type. *Exp.* 20 mm.

(22 a) *Syngamia fuscicostalis*, sp. n.

Head white with a fine black line behind, the antennæ tinged with ochreous, the frons and palpi black brown, the latter pure white in front towards base; thorax and abdomen ochreous yellow, the shoulders with black stripes, the 3rd segment of abdomen with subdorsal black spots and the two terminal segments with dorsal black-brown patches; pectus, legs, and ventral surface of abdomen white suffused with ochreous, the fore femora brownish above, the tibiae and tarsi banded black and white, the mid femora and tibiae tinged with brown, the former white at extremity, the latter with some black at base. Fore wing ochreous yellow, the costal area fuscous black, the terminal area tinged with brown; traces of an

antemedial line represented by some black scales, very oblique to submedian fold; a small black spot in upper part of middle of cell and discoidal striga expanding into a small triangular spot above; postmedial line black, minutely waved and excurved to vein 2 where it is bent inwards, then sinuous; some ochreous spots with black between them on terminal part of costa; a terminal series of black points. Hind wing ochreous yellow, the terminal area broadly tinged with brown; some blackish scales on the discocellulars; postmedial line black, oblique and slightly sinuous, ending at tornus and with a slight fuscous tinge beyond it below vein 2; a terminal series of black points; cilia tinged with black at tornus.

Hab. DUTCH N. GUINEA, Fak-fak (*Pratt*), 1 ♀; BR. N. GUINEA, Kumusi R. (*Meek*), 2 ♂, 1 ♀ type. *Exp.* 20-22 mm.

(6b) *Trithyris fulvirufalis*, sp. n.

♂. Head, thorax, and abdomen fulvous tinged with red, the sides of frons and shoulders black; antennæ ringed with black; palpi black, white towards base and whitish at tips; pectus and ventral surface of abdomen white; fore and mid legs black, the fore tibiæ and tarsi banded with white, the mid tibiæ white below, the tarsi banded white and brown, the hind legs white tinged with rufous. Fore wing fulvous tinged with red, the costa black-brown; a black point in middle of cell and the discocellulars defined on each side by a black bar; postmedial line blackish towards costa, then red, excurved from below costa to vein 3, then incurved; a terminal series of small black spots; cilia blackish tinged with leaden grey. Hind wing fulvous tinged with red; an oblique red discoidal bar; postmedial line red, excurved to vein 2, then rather diffused; a deep red terminal line with slight blackish spots on it; cilia blackish glossed with leaden grey.

Hab. PERU, Chaquimayo (*Watkins*), 2 ♂ type. *Exp.* 24 mm.

(3b) *Pilocrocis gnaptoceralis*, sp. n.

Ceratoclasia infuscalis, Druce, Biol. Centr.-Am., Het. ii. p. 244 (part.), nec Guen.

Antennæ of male angled at one-third from base, then excised for a short distance with slight scale-teeth in the sinus.

♂. Head, thorax, and abdomen dark brown with a slight reddish tinge; antennæ with the contorted part blackish; palpi white at base; pectus, legs, and ventral surface of abdomen white tinged with red-brown. Fore wing dark brown with a slight cupreous tinge; antemedial line blackish, oblique to submedian fold; a minute black spot in upper half of middle of cell and black discoidal bar; postmedial line blackish faintly defined on outer side by whitish, oblique to vein 5, excurved to vein 3, then retracted to lower angle of cell and erect to inner margin; a fine

whitish line at base of cilia. Hind wing dark brown with a slight cupreous gloss; an oblique black discoidal striga; postmedial line dark faintly defined on outer side by whitish, excurved from vein 5 to 3, then bent inwards to lower angle of cell and oblique to inner margin; cilia white with a dark brown line near base.

Hab. PANAMA, Chiriqui (*Champion*), 1 ♂ type, Godman-Salvin Coll. *Exp.* 32 mm.

(5e) *Pilocrocis fulvicolor*, sp. n.

Head, thorax, and abdomen fulvous yellow; frons with white bar; palpi red-brown, the 1st and 2nd joints white in front at base, the 3rd white at base and above; pectus, legs, and ventral surface of abdomen white, the fore femora and tibiae with blackish bands at extremities. Fore wing fulvous yellow to beyond the postmedial line, the costal and terminal areas suffused with dark reddish brown; a brown antemedial line, arising at subcostal nervure and oblique to median nervure; a dark brown point in middle of cell and oblique discoidal bar; postmedial line dark brown, slightly bent outwards and minutely waved between veins 5 and 2, then retracted to below end of cell and excurved above vein 1; cilia white with a dark line near base. Hind wing fulvous yellow, the terminal area suffused with dark reddish brown, narrowing to tornus; an oblique dark discoidal bar; postmedial line dark brown, bent outwards and minutely waved between veins 5 and 2, then retracted to below end of cell and oblique to above tornus; a dark terminal line; cilia white with a brown line near base.

Hab. BR. GUIANA, Rockstone (*Pallis*), 1 ♂; BRAZIL, Recife (*Forbes*), 1 ♀; BOLIVIA, La Paz (*Garlepp*), 1 ♂ type. *Exp.* 22-26 mm.

(5f) *Pilocrocis fulviflavalis*, sp. n.

♀. Head white mixed with some red-brown; thorax and abdomen fulvous yellow; antennæ tinged with yellow; frons brown; palpi black-brown, white below to near extremity of 2nd joint; pectus, legs, and ventral surface of abdomen white, the fore tibiae with some fuscous brown at base, a band at extremity and the tarsi fuscous brown at extremity. Fore wing fulvous yellow, the disk purer yellow, the costal area suffused with brown to the postmedial line and the costal edge white except towards base; antemedial line brown, indistinct and brown to median nervure, then incurved; a minute black spot in middle of cell and discoidal lunule; postmedial line brown, blackish towards costa, slightly excurved from discal fold to below vein 3, then retracted to below end of cell and oblique to inner margin; small black spots just before termen from apex to above vein 3; cilia pale brown, whitish towards tornus. Hind wing pale yellow, the

termen with a slight fulvous tinge except towards tornus; post-medial line brown, excurved from discal fold to below vein 3, then retracted to below end of cell and ending at tornus; cilia silvery white, pale fulvous yellow at base to vein 2.

Hab. PERU, R. Pacaya, 1 ♀ type. *Exp.* 24 mm.

(8a) *Pilocrocis pachyceralis*, sp. n.

Antennæ of male broadly laminate and with a thick ridge of scales above at about one-third from base; mid and hind coxæ with small tufts of scales, the stigmata at base of abdomen with small corneous subventral disks.

♂. Head ochreous yellow, the frons white with brown streaks at middle and sides; antennæ yellow with the ridge of scales black-brown; palpi yellow tinged with brown; thorax white with brown bars at base of patagia; abdomen white with yellowish bands, faint except towards extremity; pectus, legs, and ventral surface of abdomen yellowish, the fore legs suffused with brown, the tibiæ at extremities and tarsi with yellowish rings. Fore wing white, with a golden yellow tinge; the costal area yellow with a reddish tinge to beyond middle; a small cupreous brown spot at base of median nervure and larger subbasal spot in and below the cell; a curved dark brown antemedial line from subcostal nervure to above inner margin, forming small black spots in and below the cell; black annuli at middle and end of cell; some yellow suffusion irrorated with brown below end of cell and at middle of inner margin; postmedial line formed by a series of small black-brown lunules, arising below costa, excurved between veins 5 and 2, then retracted to below end of cell and angled outwards at vein 1; the terminal area yellow irrorated with brown to vein 4 and below vein 2, the brown forming a diffused subterminal patch between veins 7 and 4; a terminal series of brown spots; cilia white with a series of black-brown spots. Hind wing white with a slight yellow tinge; a black-brown discoidal annulus; a maculate black-brown postmedial line, arising at vein 6, excurved from discal fold to vein 2, then represented by a small spot only below vein 2 below end of cell; the terminal area yellowish irrorated with brown to vein 4; a brown terminal line; cilia white with a series of black-brown spots to vein 2.

Hab. BR. N. GUINEA, Mambare R., Biagi (*Meek*), 1 ♂ type. *Exp.* 38 mm.

(17a) *Pilocrocis poliochroa*, sp. n.

♂. Head whitish tinged with red-brown; tegulæ red-brown; thorax and abdomen grey suffused with brown; antennæ brown; palpi dark brown, white at base, pectus, legs, and ventral surface of abdomen white, the fore coxæ black-brown, the femora and tibiæ at extremities black-brown, the mid and hind femora at

middle and tibiæ at extremities below with black-brown spots. Fore wing grey tinged with brown; a faint dark antemedial line; a blackish point in middle of cell and discoidal lunule; postmedial line dark, very slightly waved, arising below costa, excurved to vein 4, then oblique. Hind wing grey tinged with brown; a blackish discoidal spot; postmedial line dark, slightly incurved beyond lower angle of cell; cilia dark brown at base, white at tips. Underside of fore wing suffused with silvery white except at costa, the postmedial line punctiform; hind wing silvery white, the apex slightly tinged with brown, the postmedial line punctiform, from below costa to submedian fold.

Hab. PERT, Chaquimayo (*Watkins*), 1 ♂ type, El Porvenir, 1 ♂. *Exp.* 38-42 mm.

(21a) *Pilocrocis flavicorpus*, sp. n.

♂. Head and thorax red-brown with a cupreous gloss; abdomen orange-yellow; antennæ dark brown; palpi yellow towards base and white at tips; fore and mid legs yellow, the tarsi, hind legs, pectus, and ventral surface of abdomen yellowish white. Fore wing uniform red-brown with a cupreous gloss, the cilia tinged with silvery white and with a fine whitish line at base. Hind wing red-brown with a cupreous gloss, rather thinly scaled except on terminal area which is broad at costa narrowing to tornus; cilia tinged with silvery grey and with fine whitish line at base.

Hab. PERT, Chaquimayo (*Watkins*), 1 ♂ type. *Exp.* 36 mm.

(22b) *Pilocrocis cuprescens*, sp. n.

♂. Head and thorax purplish red-brown with a cupreous gloss; abdomen pale cupreous brown; palpi white at base; pectus, legs, and ventral surface of abdomen white faintly tinged with red-brown, the fore tibiæ dark at extremities. Fore wing pale cupreous brown, the costal and terminal areas purplish red-brown with a cupreous gloss; an indistinct oblique brown antemedial line; a slight brown spot in middle of cell and discoidal lunule with whitish striga in centre; postmedial line brown, excurved and slightly waved to vein 2, then retracted to below end of cell and excurved above vein 1; a fine whitish line at base of cilia. Hind wing pale cupreous brown, the apical area and termen darker brown; a brown discoidal bar; postmedial line brown, excurved from discal fold to vein 2, then retracted to below end of cell and oblique to above tornus; cilia with a fine white line at base and whitish tips.

Hab. PERT, Chaquimayo (*Watkins*), 1 ♂ type. *Exp.* 32 mm.

[To be continued.]

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XLVIII.—*British Fossil Crinoids*.—XI. *Balanocrinus of the London Clay*. By F. A. BATHER, D.Sc., F.R.S.

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BEFORE considering the somewhat obscure and relatively rare stem-fragments of Pentacrinidae found in the London Clay of England, it will be well to examine the corresponding fossils that are both abundant and well-preserved in the Nummulitic rocks of Biarritz. The horizon from which the crinoid stems are there obtained is now regarded as the base of the Bartonian. Among the associated fossils are *Serpula spirulæa*, *Nummulites variolarius*, and the nummulite pair *N. contortus et striatus*.

Some specimens collected at the Port des Barques, Biarritz, by my friend Professor Jules Welsch, were recently submitted to me by my esteemed correspondent Dom Aurélien Valette, who desired my opinion on certain observations that he had made on them. Since the facts to which he directed my attention have for some thirty years past been demonstrated in the exhibited series of fossil crinoids at the British Museum (Natural History), as mentioned in the 'Guide to the Fossil Invertebrate Animals' (1907 & 1911, p. 63), it seems advisable to publish them in more accessible and more extended form. Similar facts

were discussed by Guiscardi and Meneghini (*loc. cit. infra*), but their material was not enough to permit of satisfactory conclusions.

Balanocrinus didactylus.

- Pentacrinites didactylus* d'Orb. MS., d'Archiac, 1846. Mém. Soc. Géol. France, sér. 2, tome ii. 1^{re} partie, p. 200, pl. v. figs. 16, 16 a, 17, 17 a, 18.
Pentacrinus prattii T. & T. Austin, 1847, 'Monogr. Crinoidea,' p. 124, pl. xvi. figs. 4 a-c.
 ? *Pentacrinus dixonii* Ooster, 1870, 'Protozoë helvetica,' vol. ii. p. 64, pl. xi. fig. 2.
Pentacrinus didactylus d'Orb. d'Archiac, Guiscardi, 1874, Rend. Accad. Sci. Napoli, anno xiii. p. 166.
Pentacrinus didactylus d'Orb., Meneghini, 1875, Atti Soc. Toscana Sci. Nat., vol. ii. p. 36.
Pentacrinus didactylus d'Orb., Quenstedt, 1875, 'Petrefactenkunde Deutschlands,' vol. iv. p. 268, pl. xcix. figs. 164-166.
 ? *Pentacrinus* (*Balanocrinus*?) *dixonii* Ooster, de Loriol, 1879, 'Monogr. Crin. foss. Suisse,' Mém. Soc. paléont. Suisse, vol. vi. p. 162, pl. xvii. figs. 8, 9.
Pentacrinus subbasaltiformis Miller, E. Forbes. 1852. Palaeont. Soc. Monogr. Tertiary Echinod., p. 34: refers d'Archiac's fig. 18 doubtfully to this species.

Since the choice between the trivial names *didactylus* and *prattii* depends on the dates, which are rather close, it may be well to reprint, with corrections and evidence, the bibliographic details of the Austins' Monograph that accompanied the first article in this series (Ann. & Mag. Nat. Hist., ser. 6, vol. v., April 1890, p. 308):—

No. 1.	Sig. B, c.	Pp. 1-16.	Pls. I., II., & frontisp.	1843.	April (date on wrapper).
„ 2.	„ D, E.	„ 17-32.	„ III., IV.	1843.	June or later (date on plates).
„ 3.	„ F, G.	„ 33-48.	„ V., VI.	1844.	(T. Austin, sen., adds F.G.S. on wrapper; elected Jan. 1844.)
„ 4.	„ H, I.	„ 49-64.	„ VII., VIII.	1845.	(Pl. VIII. bears date 1844.)
„ 5.	„ J, K.	„ 65-80.	„ IX., X.	1846.	(Date confirmed by Austin's MS.)
„ 6.	„ L, M.	„ 81-96.	„ XI., XII.	1847.	(Pl. XI. bears date Sept. 1846.)
„ 7.	„ N, O.	„ 97-112.	„ XIII., XIV.	1847.	
„ 8.	„ P, Q.	„ 113-128.	„ XV., XVI.	1847.	(Q. J. Geol. Soc. xxxviii., Proc., p. 53.)

The British Museum possesses the large series of specimens

brought from Biarritz by Mr. S. P. Pratt, on which the Austins founded their *P. prattii*, and it is these which form the basis of the present study. They are registered E 21943-E 22028.

The first question to settle is the generic position of the species. In 1888, when arranging the Tertiary crinoids in the Geological Department of the British Museum, I labelled the specimens of this and some other species as *Balanocrinus*, a genus which previously had not been recognized later than the Cretaceous period. It does not, however, appear that this ascription has ever been published in so many words, and down to quite recent years geologists continued to refer to the Biarritz fossil as *Pentacrinus didactylus*. Of course, it is not a *Pentacrinus sensu stricto*; what these writers mean is *Isocrinus* (see 'Pentacrinus: a Name &c.,' Natural Science, xii. p. 245, April 1898).

Characters of *Balanocrinus*.—This section was separated from *Isocrinus* by de Loriol, first as a subgenus (1879, 'Monogr. Crin. foss. Suisse'), subsequently, with the approval of P. H. Carpenter, as a full genus (1889, 'Paléont. Franç., Jurassique, Crinoïdes,' part 2, p. 295). The diagnostic characters were drawn solely from the stem, no other portion being then known with certainty. Translated into modern terminology (see Bather, 1909, 'Trias. Echin. Bakony,' pp. 24-30) and revised, they are as follows:—

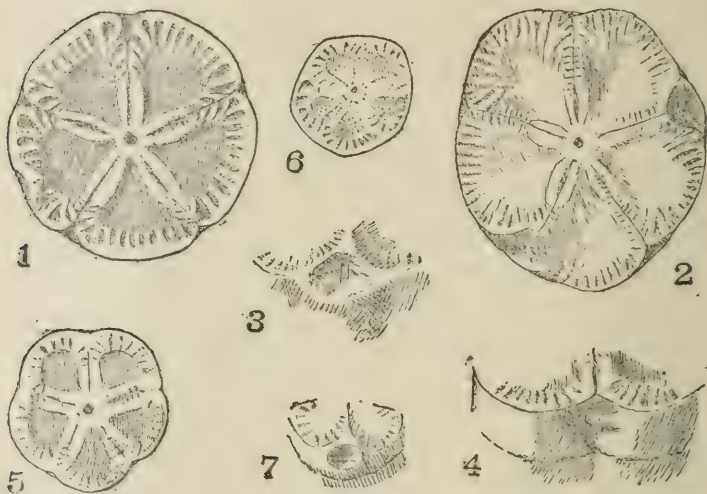
Transverse section varies usually from circular to pentagonal, and rarely to somewhat quincunclobate. Side-faces usually smooth, but may be granulate. A radial depression and pore sometimes present. Normal joint-face with peripheral crenellae short, tending to form a continuous series of subequal crenellae round the margin; with adradial crenellae opposite and set at right angles to the perradius, but always reduced in size, often to mere granules, and thus forming single or double rows passing along the perradius from the central area to the crenelate periphery. Thus the petal-floors are separated from each other by straight boundaries. Syzygial joint-face frequently with peripheral crenellae reduced in size and adradial crenellae similarly reduced or replaced by a single linear groove along each perradius, with floors smooth and on the epizygial often raised. Cirrus-facets transversely elliptical, as in *Isocrinus*.

A fine series of figures was given by de Loriol (1887-88, 'Paléont. franç.,' tom. cit. pls. clxxxii.-cxviii.).

Genotype.—*Pentacrinites subteres* Münster, in Goldfuss,

1833, named *Balanocrinus* first by L. Agassiz (1845) on erroneous characters.

It will be seen that the distinction of *Balanocrinus* from *Isocrinus* lies in the arrangement of the crenellae on the normal joint-face: "quinæ striae punctulatae a centro versus peripheriam protensae, cum Halone seu ambitu



Figures 1-4. *Balanocrinus didactylus*.

1. Normal joint-face. E 21948.
2. Syzygial joint-face of epizygial with two cirrus-facets. E. 22027.
3. A cirrus-facet, seen from the angle of the ossicle. E 22027.
4. A hypozygal notch, seen from the angle of the ossicle. E 22027.

Figures 5-7. *Balanocrinus subbasaltiformis*.

5. Normal joint-face. E 5887 b.
6. Young joint-face with more *Isocrinus* character. E 426 a.
7. A cirrus-facet, seen from the angle of the ossicle. 57543 c.

All figures enlarged 4 diameters.

crenato," as Scheuchzer so well expressed it under the heading "*Asteria columnaris Entrocho similis*" (1702, 'Specimen Lithogr. Helvet.,' pp. 2-4, pl. - figs. 1-5). In a well-preserved characteristic specimen this is clearly marked, but there is reason to believe that in young stages, or even

perhaps in the newly-formed columnals of the proximal region in older stages, the arrangement may depart less from that of *Isocrinus*. This is shown in the following figures of de Loriol's plates in 'Paléontologie Française': pl. clxxxiii. figs. 6*b*, 7*b*; pl. clxxxvi. fig. 11*b*; and to a less extent in others. On the other hand, columnals of *Isocrinus* may sometimes approach the *Balanocrinus* plan.

Description of *B. didactylus*.—Turning now to the specimens from Biarritz, we note that the Normal Joint-face is of markedly *Balanocrinus* type. There is some variation, but in a fully-grown columnal of 9 mm. diameter, from a median or distal region of approximately circular section (E 21948), the arrangement is as follows (Fig. 1):—

Outline subcircular, being slightly flattened on the inter-radii and cut into on the radii where the radial pore enters. Peripheral crenellae in each sector about 10, at right angles to the periphery, unequally spaced and of unequal thickness, those nearer the radii being stouter and sometimes double, length about 1 mm., but longer towards the radii (1.3 mm.) and rather shorter on the interradius, sometimes slightly curved or waved in their course, confluent externally, so that the suture is not crenelate. Occasionally a slight marginal rebate. Radial ridge-groups: about 3 outer pairs of adradial crenellae, continuing the slope of the adjacent peripheral crenellae, are gable-shaped, but rapidly decrease in size, and are succeeded by a series of minute crenellae, which, when visible, are in opposed pairs, but which generally unite radially to form a couple of ridges leading to the central area. These ridges are separated by the radial canal; towards the middle of their course they thicken and may be wider apart, attaining a width over all of 1 mm.; towards the centre they taper and again draw together, generally meeting with one another and with their neighbours, so as to form a narrow ring round the lumen, which ring corresponds to the central area. Lumen subpentagonal, diameter 0.4 mm. Floors depressed or even excavate, bounded adradially by concave curves (due to the widening of the radial ridge-groups).

It follows without doubt from this description that the species is rightly referred to *Balanocrinus*.

Such variations as occur in the normal joint-face, other than those already indicated, are correlated with the variation in Transverse Section. This assumes all the forms possible to a Pentacrinid stem, with this proviso—that, as in *Balano-*

crinus generally, the radial excavation is never great, although often exaggerated by the crushing to which these stems seem peculiarly liable. Thus in a rather small and slightly crushed pentapetalon (E 22028) IR is 2.7 mm., and *r.* 1.9 mm. But in a well-marked pentapetalon of 7.3 mm. diameter (E 21961) the measurements are IR 3.6 mm., *r.* 2.8 mm.

Since IR here equals half the diameter, the depth of the radial excavation is .8 mm., or less than one-ninth of the whole. The outline of the joint-face, however, is in some specimens more petaloid than the cross-section at the middle of the columnal, because the radial pore lies at the bottom of a depression, which, as viewed from the joint-face, produces the illusory effect of a radial triangle. Thus the number of peripheral crenellae is increased to 14 or more; the length of the radial ridge-groups is correspondingly lessened, but they are still composed in part of adradial crenellae following on the peripheral crenellae, so that on the whole the peculiarly *Balanocrinid* effect is obscured. At the same time the petal-floors are necessarily narrower, and, owing to the change in the radial ridge-groups, cease to be bounded by concave curves; they assume, therefore, a sub-lanceolate or kite-shaped or pyriform outline similar to that of the normal *Isocrinus* petal. In such forms the crenellae near the interradius usually cease to be confluent, so that in this region the suture is crenelate. Yet even in these forms the fused portions of the radial ridge-groups manifest their *Balanocrinid* nature.

The Syzygial Faces, both epizygial and hypozygial, depart from the normal in the greater development of the crenellae. In a specimen with mean diameter 9.4 mm. (E 22027; Fig. 2) the main peripheral crenellae of a sector are still about 14, but, instead of being confluent, they tend to increase in number towards the periphery, either by forking or by intercalation of narrower shorter crenellae, or in both ways. An intercalated crenella on the epizygial corresponds to a fork on the opposed hypozygial, and *vice versa*. In the specimen referred to, which is a rounded pentagon with slight tendency to lobation, the normal crenellae on the interradii are still short, about 0.6 mm.; but the crenellae become gradually longer as the radius is approached, so that some attain a length of 1.6 mm. The inner ends of these long crenellae die away gradually into the floor, and in some cases two normal crenellae may join, so that from a single stem spring two main branches, each of which forks again,

while between the forks is an intercalated crenella, making five denticles at the periphery. The change from these peripheral crenellae to those of the radial ridge-groups is rather rapid, but the outermost adradial crenellae show a similar disposition to increase by the same methods. Thus the crenellae of the ridge-groups, so long as they can be distinguished, display a slight alternation in size. In a radius 4.3 mm. long the crenellae can be distinguished for about 2.6 mm. from the periphery, after which they coalesce into the parallel or bowed ridges. These last do not unite to form a ring round the central area. The floors are much less depressed than in normal joint-faces, and may even be flush in some specimens. In the Epizygial the radial ridge-groups leading to the cirrus-facets (of which there are two in E 22027) are gradually raised towards the periphery from the point where the crenellae cease to be distinguishable. In the Hypozygal (which in the same specimen shows the indent of only one cirrus-facet) the corresponding tract is depressed, and the radial canal opens outwardly into a strong V-shaped notch (Fig. 4).

A similar tendency to multiplication of crenellae on the syzygial joint-face is well shown in *Isocrinus hercyniae* Bather (1909, 'Trias. Echin. Bakony,' pl. iv. figs. 108-110), a species which in some respects approaches *Balanocrinus*.

We pass now to the other variations seen in the Biarritz stem-fragments. Most of these have been alluded to by one or another of the previous writers, and have occasionally given rise to doubts concerning the homogeneity of the species.

The transverse section is rarely quite symmetrical, but, apart from the modification due to the cirri, the variation from symmetry is clearly due to Mechanical Crushing. This has in some cases flattened the specimens into bands: in E 21943 the diameters are 10 mm. and 4.4 mm. This effect is not without interest, as indicating a very weak internal stereom. A further result of the crushing is the formation of five longitudinal cracks, so that such a stem is at first reminiscent of those Palaeozoic stems that are split into pentameres. The cracks in the Biarritz specimens, however, are not confined to the radii, where any division into natural pentameres would occur, but are also on the inter-radii, or in other words at the outer apices of the sectors (E 22026, cf. d'Archiac's fig. 16a). Both positions are taken by the cracks in E 22025, and the fracture on the interradii contrasts with the clean jointing on the radii.

In pentagonal forms therefore the cracks coincide with the angles. This indicates that the weak stereom occupies the ligamentar tracts, as might be expected. Further evidence of this is afforded by the five interrarial pillars of dark colour that run through every internode from top to bottom and are seen on broken or ground surfaces (*e. g.*, E 22024), for the colour is due to the carbonized remains of the ligaments (see Bather, 1893, 'Crin. Gotland,' p. 151, and 1909, 'Trias. Echin. Bakony,' p. 204).

In mean Diameter the fragments vary from 4 mm. (E 21953) to 9.4 (E 22027). This doubtless represents growth, and the larger forms are by far the more common in the collection.

The Side-Faces in a large number of specimens are quite smooth, but in some there are small granules scattered over the surface (E 21966); these granules may be elongate either vertically or transversely, and may run together to form irregular lines, a sort of vermiculation (E 21965); or they may run into transverse ridges, at the equator and the sutural margins (E 22024); the commonest arrangement seems to be one ridge at the equator of the columnal, either compound (E 21968) or simple (E 21969, *cf.* d'Archiac's fig. 17 *a*), and this is often accompanied by an equatorial swelling of the columnal (E 22022). In such cases the intervening granules, if any, tend to lie beside each radius (E 22020 and E 22023).

This leads to another series of variations, namely from a plane side-face, producing a straight-sided column (E 22021), through slightly swollen, to obtusely ridged (E 21970 to E 21974). The ridge is often sharply cut and may be smooth, or accentuated by the line of granules previously mentioned. In one specimen, E 21985, the side-faces are slightly excavate, or, in other words, the columnal is thickened at the sutures.

In the smooth specimens the columnals are equal in height (*cf.* d'Archiac's fig. 18), except for the slightly higher epizygial and slightly lower hypozygal. The following are a few measurements:—

	E 22020.	E 22021.	E. 21959.
	mm.	mm.	mm.
Mean diameter	7.7	8.4	8.5
Height	2.1	2.4	2.8

Inequality in height of columnals usually becomes manifest

in those that are swollen or ridged, but is more marked in lobate or stellate examples (*cf.* d'Archiac's fig. 16 *a*). At first one observes a simple alternation in height, in E 22019 the heights are 2.5 mm. & 2.0 mm., mean diameter 6.7 mm.; then an increase in the diameter of the higher ossicles, thus in E 21961 the measurements are 2 mm. & 7.3 mm., and 1.7 mm. & 7.0 mm., respectively; finally, columnals of 3 or more, perhaps 4, orders, distinguished by both height and diameter (E 21964). In quinquelobate fragments the larger projecting columnals are not so depressed radially as are the smaller ones, and this produces a somewhat scalariform surface (E 21964).

The Number of Columnals in an internode, as observed in the dozen intersyzygia available, varies from 15 to 32. The material is too limited to permit of satisfactory conclusions being drawn, but the following facts may be noted. The highest columnals occur in the internodes with only 15: in E 21981 the height is 2.55 mm., in E 22027 it alternates from 3.2 to 2.5 mm. The lowest columnals are in the internode with 32 (E 21983), where they are in three orders, from 1.7 to 0.8 mm. This last has a stellate section and certainly comes from a more proximal region of the stem. Three orders are also manifest in the specimen with the next number of internodals, viz., 31 (E 20982), but the height of the ossicles is rather greater, 2.6 to 1.5 mm. The two fifteneers are plane and quite smooth (E 22027) or with a slight ridge of sparse granules (E 21981). Those with the higher numbers have more or less swollen and ridged ossicles as a rule. E 21975 is exceptional in that, though ridged, it is plane and has equal internodals of 2.5 mm. in height. On the whole, the facts suggest that the height of the internodals was greater in the distal region, but that the whorls were at more frequent intervals. This applies only to full-grown individuals. While height of columnals and the extent of their alternation in size must depend mainly on position in the stem, it appears that ridging and swelling have not that connection—at all events, in so great a degree,—but are characters of the individual. Stellation or marked lobation were probably most common in young stages and in the proximal region of adult stems; the facts are consistent with that view, but there was certainly some individual variation as between circular, pentagonal, and slightly lobate.

The Radial Pore lies at the bottom of a depression, which is well marked in some specimens, generally smooth ones

(*cf.* d'Archiac's fig. 18), but faint in others, generally those with tendency to stellation (*cf.* d'Archiac's fig. 16 *a*), and absent in yet others, especially the more ridged and lobate (*cf.* d'Archiac's fig. 17 *a*).

The Cirrus-facets (Figs. 2, 3) lie on the extreme lower margin of the epizygal, causing it to project beyond the general level of the syzygial face and to cut into the hypozygal (*cf.* d'Archiac's figs. 16 *a*, 17 *a*). The facet is directed obliquely downward, so that the ensuing cirrals are at once received into a depression of the hypozygal (Fig. 4). The same arrangement obtains, but to a less extent, in the recent *Isocrinus decorus*. The epizygal projects gradually from its upper margin down to the facet, so that in a nodal with two facets the diameter measured across the facets is greater than that at right angles to it. Thus the facet may project for more than half its vertical (*sc.* radial) diameter beyond the margin of the hypozygal (E 21984), but there are considerable differences in the extent of the projection.

The outer margin of the facet is a semi-ellipse, but the inner margin consists of two straight lines meeting on the radius in a rounded angle. This angular boundary is correlated with the radial elevation of the epizygal joint-face already described. The fuleral ridge separates the semi-elliptical part of the facet from the triangular part, the former part being the larger. The ridge approximately continues the regular outline of the periphery of the columnal; thus in E 21990, viewed perpendicularly to the facet, the ridge lies in a straight line with its ends at the angles where the straight boundaries cut the curved boundary of the facet, and the axial canal lies in the middle of the fuleral ridge a little on its inner side. But in most cases, the fuleral ridge, in similar view, is bent, the axial canal lying nearer to the centre of the columnal, and the two halves of the ridge being directed outwards so that their ends are in the elliptical half of the facet (E 22027). When the angular boundary cuts far into the joint-face, and the semi-ellipse is correspondingly reduced, then the axial canal and fuleral ridge are carried inwards, and the ends of the ridge lie within the triangle (E 21976). The fuleral ridge generally widens to surround the axial canal, and from here it generally tapers towards its ends; it never widens or thickens at the ends. The floor of the whole facet is bent into a concavity varying in depth and angularity with the curve of the outer boundary. The fuleral ridge therefore is bent with this and never really forms a straight line.

Measurements of cirrus-facets in millimetres :—

	E 21984.	E 21982.	E. 21978.	E 22027.
Mean diameter of columnal . .	7.65	8.2	9.1	9.4
Width of facet	2.0	2.3	2.75	2.5
Radial diameter of facet	1.6	1.8	1.6	2.0
Distance of axial canal from outer margin	1.0	1.15	1.2	1.2

The cirrus-notch in the hypozygal varies greatly in depth. Sometimes it is a slight almost V-shaped notch in the margin. Sometimes a channel, gradually shallowing, stretches down the radius over two or even three columnals. How far this appearance is due to pressure after burial is uncertain, but it is worth noting that in E 21989 the granular ridge of the hypozygal side-face continues across such a channel. A characteristic form is seen in some well-preserved specimens (*e. g.*, E 22027, Fig. 4; E 21978); as seen from the side it is of roughly four-sided outline, and occupies the upper two-thirds of the side-face; the shorter vertical sides approach one another slightly as they pass downwards, the upper edge is clearly marked, and is sharply bent inwards, corresponding no doubt to the angular inner margin of the formerly apposed cirrus-facet; the floor is marked with two indentations, one above the other, and presumably corresponding with the first and second cirrals. In E 21989 three such indentations are seen in succession, and the dividing elevations can be distinguished from the continuations of the granular ridges previously mentioned.

The remains of Cirri are rare. In only one or two cases is a cirral ensconced in the hypozygal notch or lying close by; in no case is a cirral still attached to the facet. In E 21989 a single cirral lies on the joint-face of the hypozygal. Its joint-face is a broad ellipse with one side flattened; the long diameter is 1.75 mm., the short one is 1.3 mm.; the margin is slightly raised; the fuleral ridge bisects what would have been the ellipse and passes round the axial canal, widening more to the elliptical boundary of the joint-face. Since on the facet the straight side of the fuleral ridge is the outer side, it may be inferred that the flattened side of the cirral was outermost, and that the curved side rested in the hypozygal notch. The height of this cirral is about .8 mm. Whether the face described is proximal or distal cannot be decided.

Alternicirration.—The most interesting feature in this species is that diminution in the number of cirri at the whorl to which the name *didactylus* is due. The number 2

is perhaps predominant; it is seen, for instance, in E 21977-21982, E 21984, E 22027. But the number 3 is also common, and occurs in E 21983, E 21985-21993, E 21975. Occasionally only one facet is found, as in E 21977 epizygal, E 22027 hypozygal. Not a single specimen has more than 3 facets to the node. Meneghini (*op. cit.*, pp. 40, 41) refers to this species specimens from the Eocene of Albettone in the Euganean Hills, one with 4, another with 5 facets; but his reference is unconfirmed.

Only about half of those specimens in which one of the syzygial faces is preserved have the intersyzygium complete. But those that have are enough to show that the cirri are distributed according to a definite plan. When there are three facets at one end, they are not adjacent, but one is opposed to the two others, being separated from them on each side by a blank radius. At the other end of the intersyzygium there will never be 3 facets, but only 2; and these will occupy the radii left blank at the other end. The arrangement may be symbolized thus:—

A	b	C	D	e
a	B	c	d	E

The next case is when there are 2 facets at each end. The arrangement then is

	a	B	c	D	e
	a	b	C	d	E
or	A	b	C	d	e

In only one specimen, E 21984, does a facet appear to be repeated on the same radius, thus:

a	B	c	D	e
A	b	c	D	e

but the specimen has been shifted in the middle and probably twisted also.

In the rare cases where only one cirrus was borne by the nodal (*e. g.*, E 21977), it seems to have alternated in position with two at the other end,

a	B	c	D	e
a	b	C	d	e

In E 22027, however, the single notch on the hypozygal is on the same radius as one of the two facets on the epizygal.

It seems probable that there was rarely a long succession of whorls with only two cirri, still less with only one, but that the succession was 2 : 2 : 3. Considering the fairly large proportion of specimens with whorls of three in our material, it is strange that that number should not have been noted by previous writers. Dom Aurélien Valette, in his letter of 14 September, 1916, does, however, say "deux ou trois tout au plus."

Quenstedt (1878, 'Encriniden,' p. 268, pl. xcix. fig. 170) gave the name *Pentacrinus tridactylus* to a stem-fragment from Tertiary beds near Castellane in S. France because there were 3 cirrus-facets opposed at the node. This, however, seems from the figure to be an *Isocrinus*.

The preceding facts fully bear out the anticipation of P. H. Carpenter in his description of *Pentacrinus alternicirrus* (1884, 'Challenger Rep., Stalked Crinoids,' pp. 322, 323), which is referred by A. H. Clark to his *Endocrinus*. In that species there is a regular alternation of 2 with 3 cirri to the whorl, as "the leaves on the stem of a Labiate plant." Only one irregularity was noted in the whole 147 nodes examined: in one stem the seventh and eighth nodes both bore 3 cirri in such a position that one cirrus fell on the same radius in both whorls. Carpenter mentioned the reduction of cirri to two in *Pentacrinus bronni* Hagenow (which is a *Balanocrinus*), and *P. didactylus*, and to three in *P. tridactylus*, and suggested that "if longer pieces of these stems were known they might show the same regular alternation in the positions of the successive cirrus-whorls which is so striking in *Pentacrinus alternicirrus*."

Neither in his published writings nor in his letters to me on this subject did Carpenter suggest any cause for this remarkable peculiarity, and the matter has since remained where he left it.

We turn now to the similar specimens from the London Clay. Concerning them the main questions to be answered are: What is their generic position? Do they include more than one species? Are any or all of them conspecific with any of the foreign specimens? The answers to these questions are given in the following Synonymy:—

Balanocrinus subbasaltiformis.

"x d 58. Entrochus-Asteriae, from a Brick Clay-pit, on the South-side of Islington."

"x d 59, 60. Entrocho-Asteriae, found in the Tile Clay-pit behind Trinity-Chapel, at the end of Bondstreet, St. James's."

- J. Woodward, 1728. 'Catalogue of the Additional English Native Fossils &c.,' tome ii. p. 51.
- Pentacrinites subbasaltiformis*, provisional name for stem-fragments obtained by J. Sowerby at Islington; also said to occur at Richmond and Kensington; incompletely described. J. S. Miller, 1821, 'Nat. Hist. Crin.,' p. 140.
- Pentacrinus subbasaltiformis* Miller, J. de C. Sowerby in Wetherell, 1840. 'Observations on a Well dug on the South side of Hampstead Heath.' Trans. Geol. Soc., (2) v. p. 136, pl. viii. fig. 3 a (non 3 b).
- Pentacrinus sowerbii* (Wetherell MSS.), J. de C. Sowerby, *op. cit.* pl. viii. fig. 4.
- Pentacrinus subbasaltiformis* Miller, T. & T. Austin, 1847, 'Monogr. Crinoidea,' p. 122, pl. xvi. fig. 2.
- Pentacrinus sowerbii* Wetherell [*sic*], T. & T. Austin, *op. cit.*, p. 123, pl. xvi. figs. 3 a, 3 b.
- The Austins' figures all appear to be exceedingly bad copies of Sowerby's. They add no fact except that *P. subbasaltiformis* has been recorded from Herne Bay.
- Pentacrinus subbasaltiformis* Miller, E. Forbes, 1852, 'Palaeont. Soc. Monogr. Tertiary Echin.,' p. 34, pl. iv. figs. 8, 9, 10.
- Pentacrinus sowerbii* Wetherell [*sic*], E. Forbes, *op. cit.*, p. 35 and text-figs. 2 a, b, c on p. 36.

It is a little difficult to say what should be the Holotype. If Miller's incomplete and unillustrated reference, which he says was purposely not intended as a diagnosis, were to be accepted, then the stem-fragments supplied to him by J. Sowerby would be syntypes; but these, if they are extant, certainly cannot be identified. It is therefore simpler to start from J. de C. Sowerby; and in this case one would naturally take the specimen from the Wetherell Collection which he figured. This should be in the British Museum, but I am unable to find any specimen from Hampstead agreeing with the drawing. I therefore fix on no. 57540, which is certainly a syntype of J. de C. Sowerby's, and may legitimately be made the Lectotype. This specimen is a fragment in matrix, and comprises parts of two internodes meeting at a syzygy, one part 18·8 mm. long, including 9 columnals, the other 37·5 mm. long, including 19 columnals; there are two cirrus-facets at the syzygy.

The material studied consists of some seventy stem-fragments in the British Museum (Natural History), obtained from the collections of J. S. Bowerbank, F. E. Edwards, N. T. Wetherell, E. Spencer, Toulmin Smith, R. Matland, James Baber, and W. Mellis. They come from the London Clay of the following localities:—Bracklesham Bay, Sheppey, Harwich, Sewardstone in Essex, and in the London area—Hampstead including the famous well (Trans. Geol. Soc. 1840) and the cutting of the London & North-

Western Railway, the tunnel near Chalk Farm, Haverstock Hill, Copenhagen Fields in Islington, Lambeth Hill in Upper Thames Street, E.C., and Hornsey.

The specimens from Sheppey are all pyritized, and many of those from the older collections have decomposed. Those from the Hampstead neighbourhood are mostly in limonite. Those from other localities occasionally retain the original calcite, but this is usually impregnated with iron or changed into one of the above forms. The state and mode of preservation usually obscure the joint-faces and often alter the shape of the specimens; but some fragments from Copenhagen Fields (E 426) have been so little petrified that they show the original structure of the stereom.

The material includes the type-specimens of *Pentacrinites sowerbii* (E 5888 *a, b*) and the original of Sowerby's figure 3 *b* (57539; see under "Conclusions," p. 405).

The resemblance of these specimens to those of *B. didactylus* from Biarritz is so great that foreign authors, relying mainly on figures, have more than once suggested that such or such a variation in the latter was conspecific with one or other of the British forms. It has here been shown that the Biarritz specimens, in spite of their differences, are linked by gradations into a single species. One form alone, therefore, cannot be taken out for association with one of the British forms. On the other hand, these latter, in spite of their general and occasional resemblance, display as a group certain differences which justify their retention in a separate species.

The Normal Joint-face, in many specimens (*e. g.*, E 426), approaches nearer to the *Isocrinus* type than do any examples of *B. didactylus*, but in others it has the *Balanocrinus* character (*e. g.*, E 5887 *a, b*), and it is the latter that must be compared with the normal *B. didactylus*.

In a slightly quinquelobate internodal of 5.7 mm. diameter (E 5887 *b*, Fig. 5) there are 7 or 8 peripheral crenellae to the sector, at right angles to the periphery, evenly spaced so far as one can see, straight, those near the interradius .4 mm. long, those near the radius .7 mm., externally confluent. Radial ridge-groups begin with 3 or sometimes 4 pairs of crenellae, at first .4 mm. long, in pairs gable-shaped and alternating, but rapidly becoming shorter and opposed as they near the centre. At 1.1 mm. from the periphery, along the radius, these give place to the parallel adradial ridges, which pass into a raised central area. The ridge-pair has a width of .9 mm. and the radial canal is not clearly

shown. The petal-floors are shaped as in *B. didactylus*, are flat, and not so much depressed. The pentagonal lumen, with radial angles, has a diameter of about .2 mm.

In such a joint-face the essential feature that gives the *Balanocrinus* character is the distinction between the peripheral crenellae and those of the ridge-groups as marked by the sudden change of length and of angle. Thus the angle made by the most adradial of the peripheral crenellae with the one next it is about 32° , but that made with the adjacent crenella of the ridge-group is about 55° . There is actually more distinction in this way than was noted in *B. didactylus*.

The actual number of peripheral crenellae is less than in *B. didactylus*, and, since in each case we are dealing with full-grown examples, this is not due to the size of the columnal. The length of those crenellae relative to the diameter of the columnal is less than in *B. didactylus*, and the transition from the interrarial length to the adradial is more gradual; the shortness is rather a *Balanocrinus* character, but the gradual transition is as in *Isocrinus*.

As representing the *Isocrinus* type of normal joint-face may be taken one of the well-preserved fragments E 426 a (Fig. 6). This is subcircular, tending to pentagonal with rounded angles. Mean diameter 4.1 mm. Peripheral crenellae not more than 7, and less if the adradial ones be reckoned with the ridge-groups, into which they merge insensibly; length gradually passing from .5 mm. interradially to .7 mm. adradially; evenly spaced, confluent externally, sometimes subconfluent internally. Ridge-groups: outer adradial crenellae only 3 or 4 in all, gabled alternating, with no sudden change of angle or size from the peripheral crenellae; at 1.0 mm. or less from the periphery they change into the parallel radial ridges, which are relatively wide (.8 mm.) and meet in a rather large central area only slightly less raised than themselves. The radial canal is rarely seen, for these specimens have no radial depression or pore apparent. Lumen pentagonal, with a diameter .3 mm. or less. Petal-floors kite-shaped, outwardly depressed, but rising towards the central area; they are pitted by minute canals for the passage of the ligament fibrils, dispersed over the middle of the floor, but on each side forming a straight series, which continues on to the central area, where the two series end in a pair of slightly larger canals. In vertical section these canals can be traced following a straight course through the stereom, which has a marked vertically fascicular structure, slightly denser at half the height of the ossicle where it was first formed.

The series of pits bordering the floors explain the incised lines sometimes seen in this position on the weathered fossils, *e. g.*, 57542 *d*. The looser stereom of the floors being more readily weathered, these tracts are often deeper in the fossils than they can have been in life. Sometimes advanced weathering or decomposition emphasizes this greatly (57551 *a*) and also brings out the weak structure of the stereom under the radial canal; in decomposing pyritized specimens the columnals break into pentameres along the radial planes, though in crushed specimens (*e. g.*, 57542 *a*) the cracks usually follow the lines of interrarial weakness. Thus is brought out here, as in *B. didactylus*, the difference between the original pentamerism and the secondary concentration of the stroma fibres along interrarial pillars.

Between the *Isocrinus* and *Balanocrinus* types of normal joint-face there seems to be every possible gradation. There are no grounds for supposing that the material comprises two species, and consequently it cannot comprise two genera.

The Syzygial Joint-face of an Epizygial is well shown in 57543 *c* (*cf.* W. H. Baily's drawing in Forbes, pl. iv. fig. 8, which, for all its inexactness, gives the general appearance well). There are 2 facets; diameter parallel to a line joining the facets 5.5 mm.; diameter at right angles to this 5.0 mm. Corresponding with the facets the radial tracts are raised, as in *B. didactylus*, though not quite so markedly. Peripheral crenellae about 7, broadening outwards and confluent; length on the interradius .2 mm., gradually increasing to 1.0 mm., but these long ones die away into the floor. Radial ridge-groups comprise about 3 pairs of reduced obscure crenellae, rapidly decreasing in size towards the centre, and tending to lie at right angles to the radial canal; this last is little more than a fine line, and is bordered by no raised ridges. Petal-floors flush.

The Hypozygial joint-faces are not clear; apparently they correspond, *mutatis mutandis*, to the epizygial face, but are not so strongly marked. One of the clearest is in 57543 *b*.

The Transverse Section of the stem is generally sub-cylindrical, usually varying towards either pentagonal or quinquelobate, as in all figures of Sowerby and Forbes. The specimens seen by J. S. Miller were no doubt sub-pentagonal—hence the name *subbasaltiformis*. Those in J. Woodward's collection were probably subcylindrical, like other *Entrocho-Asteriae*. Quinquelobation may occasionally be marked, but no specimen can be called stellate, though that condition is approached by 57541 and E.21926.

The Diameter varies from 3 mm. (57542 *e*) to 6.4 mm. (57541); in general it is about two-thirds that of *B. didactylus*.

The Side-Faces in all specimens appear smooth, but the state of preservation is such that the original surface has often been destroyed or coated over, so that minute granules may have occurred in some stems. The surface is also plane or equable as a rule, but various specimens show slight swellings either about the equator of the columnal (*cf.* Forbes, fig. 9) or near each margin; occasionally there are irregularities suggestive of the granules that border the radii in some specimens of *B. didactylus*. There are, however, no such marked ridgings as occur in that species. Some specimens have radial pores well marked (Sowerby, fig. 3 *a*; Forbes, fig. 8), others appear to be entirely without them; but there are intervening gradations.

The Number of Internodals varies from 14 in 57541, which is from a proximal region (*vide infra*), to over 29 in the two smooth specimens under 57551.

The internodals of smooth forms are equal in height, but the syzygial ossicles are usually lower in adult stages. The following are some measurements in millimetres:—

	57542 <i>e</i> .	57542 <i>c</i> .	E 5633 <i>a</i> .	57543 <i>c</i> .	57540.	57843 <i>d</i> .	57543 <i>b</i> .
Diameter	3.0	3.7	4.6	5.1	5.2	5.6	5.9
Height of internodal	1.7	1.7	2.1	1.0	1.9	1.6	2.1
Height of epizygal	1.5	..	2.0	2.0	1.8	1.3	2.3

Alternation in Height of internodals is more frequent in the quinquelobate or substellate fragments, which no doubt come from more proximal regions of the stem. It is usually accompanied by a slight increase in the diameter of the ossicle. In 57542 *a*, with mean diameter about 3.5 mm., internodals of 1.2 mm. are interspersed with others of 1.0 mm. in height; the epizygal is 1.35; the hypozygal 1.0 mm. In 57542 *b*, with diameter 4.2 mm., the internodals are arranged thus:

$$1.4 / 1.8 / 1.4 / 2.1 / 1.4 / 1.4 / 1.8 / 1.4 / 1.8 /$$

In 57543 *a*, with diameter 5.0 mm., the height of internodals varies between 2.0 and 1.7, the epizygal being 1.8 mm. In 57541, with diameter 6.1 mm., and well-marked rounded stellate section, there are two epizygal (Order I), each about 1.5 mm. high; between these are three internodals of about 1.3 mm. (Order II), separated from each other and from the epizygal by 3 internodals of

about 1.0 mm., the middle one (Order III) in each case being very slightly higher than the two others (Order IV). The difference in diameter can scarcely be measured, and probably does not amount to more than .05 mm. on the outer angles, but it is more apparent on the re-entrant sides.

Forbes said that the section was more stellate in younger specimens. There is, however, no correlation at all between size and stellation or lobation, but the correlation with alternation that does exist indicates that the proximal region is more stellate or lobate.

This leads us to consider the two specimens hitherto separated as *Pentacrinus sowerbii* (E 5888, *a*, *b*). They were fairly well represented in Sowerby's engravings (fig. 4); *a* is the fragment in matrix, *b* the isolated fragment. They belong, however, to a single stem, which has broken at the syzygy so that the epizygal with 2 facets is on *b* and the hypozygal on *a*. The cirrals attached to the epizygal are shown at the top end of Sowerby's figure. Diameter 5.4 mm.; section quinquelobate. In *b* are 25 internodals, which appear to be in three orders, though possibly it should be four. The height of the epizygal (Order I) is 1.3; that of Order II about 1.0; of Order III .9 to .8; of Order IV .6 to .5 mm. The arrangement, starting at the proximal end is III, IV, II, IV, III, IV, II, III, IV, II, IV, III, II, III, IV, II, III, IV, II, IV, III, II, IV, III, I. The differences between the orders are more marked in their diameters, and may amount to .5 mm., but the condition of the specimen renders exact measurement difficult.

Owing to the confluence of the crenellae in most cases, the suture-line is rarely crenelate. The following specimens, however, show some crenelation at the interradian angles: 57542 *a*, *d*, *e*, E 21967, E 21969. All these are somewhat lobate or stellate. Crenelation might be detected in other examples were it not for their patination. Its presence, of course, indicates that the crenellae have not yet become confluent so as to form an entire margin—for instance, the association of a crenelate suture-line with confluent crenellae, as in Forbes's fig. 10, is merely evidence of inaccuracy. Crenelation is therefore rather a sign of youth, or, in conjunction with lobation, of recent formation, as in the proximal region. As one would expect therefore, crenelation is best seen in *P. sowerbii*, where it is almost obscured on fragment *b*, but very clear on fragment *a*. In the latter the crenelation extends over the sutural margin down the side-face towards the equator of the columnals,

where the indents of one margin alternate with those of the other. This produces a granulate effect.

The Cirrus-facet is at the margin of the epizygial and facing downwards, as in *B. didactylus*, but does not project so far beyond the general outline of the columnal. In 57543 *c* (Fig. 7) the outline is elliptical, with the axial canal and fuleral ridges dividing it into unequal halves, the larger being on the outside. The fuleral ridge is straight, on a line with the periphery of the columnal. It thickens slightly round the canal and towards the ends. The floor of the facet is curved as in *B. didactylus*, but to a less extent. The diameters are 1.2×1.0 mm. on one facet, and 1.0×0.9 mm. on the other. Although the inner half of the facet has not the triangular shape seen in *B. didactylus* (Baily's drawing being inexact on this), there is an inward prolongation of its margins which produces an angular outline as seen from the syzygial face and indicates how the excavation might be extended. Other specimens present slight variations of measurement, but the plan is essentially the same.

The notch on the hypozygal is not so marked as in *B. didactylus*.

Cirrals are occasionally preserved, either attached to the epizygial or lying in a very shallow channel on one or more of the subjacent columnals. They indicate a rapidly tapering cirrus, of subelliptical section, with the upper (*i. e.*, outer) side flattened, in the way that appeared probable in *B. didactylus*. The greatest length indicated is 9.6 mm. (57543 *d*).

The number of cirri to a whorl varies between 1, as seen in 57543 *d*, E 21926, E, 21927, E 5887 *a*; 2, as in 38620, 49834 *b*, 57540 (lectotype), 57541, 57543 *b*, *c*, E 5887 *a*, *b*, E 6480, E 21920, E 21929, E 21931, E 21932, E 21934, E 21937, E 5888 (*P. sowerbii*); and 3, as in 49834 *a*, 57541, 57542 *a*, 57543 *a*. Fragments containing two whorls are 57541 with 3 & 2 facets, 57543 *b* and E 5888 with 2 & 2, 58887 *a* with 2 & 1. The arrangement in all of these is as in *B. didactylus*. The only exception is presented by E 21942, from Harwich, which contains 2 syzygies, one of which appears to bear only 1 facet, and the other 2 facets, separated as usual by a blank radius; but one of these latter lies on the same radius as the single facet on the other whorl. The specimen, which lies on matrix, has, however, been broken across in several places, and the fragments may well have been replaced with the wrong orientation.

SUMMARY AND CONCLUSIONS.

All the specimens from Biarritz to which d'Archiac and others have applied the name *Pentacrinus didactylus* belong to a single species.

Examination of normal adult joint-faces shows that that species falls within the genus *Balanocrinus* as ordinarily understood.

The specimens from the London Clay to which the names *Pentacrinus subbasaltiformis* and *P. sowerbii* have been applied, with the exception of a few fragments erroneously determined, may be assembled in a series that falls within limits of variation no greater than those of *B. didactylus*, and in some respects even less. Therefore those specimens all belong to a single species.

That species also belongs to *Balanocrinus*, though the characteristic features are less pronounced.

The Biarritz species and the London Clay species are, however, distinct from one another, and must be known respectively by the names *Balanocrinus didactylus* d'Archiac ex d'Orbigny, and *Balanocrinus subbasaltiformis* J. de C. Sowerby ex Miller.

Sowerby's figure 3 b (Brit. Mus. 57539), supposed by him to represent a cirrus of *P. subbasaltiformis*, is a stem of *Isocrinus* character with a pentagonal section actually visible in Sowerby's engraving. It appears to be the stem of the later-described *Cainocrinus tintinnabulum* Forbes.

Pentacrinus dixonii Ooster, may be the same as *Balanocrinus didactylus*, but Ooster's name must form the subject of a separate note.

Pentacrinus diaboli Bayan, which Meneghini referred to *B. didactylus* as interpreted by him, is an alternicirrate *Balanocrinus*, with 2 & 3 facets to the whorl, but differs in its marked pentagonal section and other respects from d'Archiac's species (Brit. Mus. E 22032-22052).

Pentacrinus lorioli Noelli (1900, Atti Soc. Ital. Sci. Nat., xxxix. p. 28, pl. i. figs. 33, 34), based on cylindrical stem-fragments from the Upper Helvetian of Piedmont, was referred by me to *Balanocrinus* in the 'Zoological Record' for 1900 (1901), by reason of its joint-face, which Dr. Noelli himself compared with that of *B. bronni*. The "due infossature molto distinte" on what is presumably the hypozygal indicate that the stem was alternicirrate.

Pentacrinus subbasaltiformis Miller, var. *subrotundus* De Gregorio (1894, Ann. Geol. et Pal., Livr. 13, p. 17, pl. ii. figs. 41, 42), from the Bartonian of Valrovina, may be

Balanocrinus didactylus, but the joint-faces of the holotype are admittedly obscure. The variety is in any case unnecessary.

There may be one or two more Tertiary species of the same general type, *i. e.* alternicirrate *Balanocrinus*, and it seems probable that all these species may be genetically related. It is, however, improbable that they are related to the recent *Endoxocrinus alternicirrus*, which resembles them only in its alternicirration. What was the advantage of this peculiarity, or how it first arose, are questions that still seek an answer.

Another question is as to the origin and advantage of the *Balanocrinus* plan of joint-face. Assuming the simply radiate *Entrochus* plan to be the oldest, then the *Isocrinus* plan developed from this by the concentration of the ligaments in 5 pillars, and it is plain that this plan must have preceded that of *Balanocrinus*. Possibly the reduction of the radial ridge-groups merely continued when once started, and was in part accelerated by their decreasing utility according to the law of economy.

Such an explanation suggests the further hypothesis that the *Balanocrinus* plan arose from that of *Isocrinus* several times over between the Trias and the Oligocene, and that it does not characterize a homogeneous monophyletic genus.

The general tendency of economy of material in *Isocrinus* is in the direction of stellation—the cutting-out of stereom that lends no strength to the column (*cf.* Ionic as derived from Doric, or Gothic from Norman). But in those species that did not adopt this mode of retrenchment, remaining cylindrical or basaltiform, the economy was effected in the reduction of unnecessary ridges on the joint-face, possibly combined with stronger radial ligaments.

Finally, on this hypothesis, the alternicirrate *Balanocrini* of the early Tertiary rocks form a homogeneous group, derived from some Cretaceous species, such as the Upper Senonian *Pentacrinus bronni* Hagenow, the Lower Danian *P. paucicirrus* Nielsen, and the Upper Danian *P. crassus* Nielsen. These three form a continuous series of alternicirrate forms, with joint-faces of *Balanocrinus* plan, and so closely resemble one another in stem-characters that no difference is apparent in the descriptions or figures.

Dr. Brünnich Nielsen (1913, Danmarks geol. Undersøg., ii. Raekke, Nr. 26, pp. 6-8 & 81) rejects the genus *Balanocrinus*, because in a single species (*P. paucicirrus*) he finds joint-faces of both *Isocrinus* and *Balanocrinus* plan, with all

gradations between them, just as we have seen to be the case in the Eocene species, and, as pointed out at the beginning of this article, long known in many Jurassic species also. The objection, therefore, had it been considered sound, might have been raised many years ago; but the facts are much what we might expect on any hypothesis of the origin of *Balanocrinus* from *Isocrinus*, and are certainly consistent with the special hypothesis here advocated of the multiple origin of *Balanocrinus* from successive species or species-groups of *Isocrinus*. It may be impossible to assign an isolated ossicle to its correct genus, but the stem must be considered as a whole.

Admitting the polyphyletic origin of the genus *Balanocrinus* as hitherto conceived, our future task is to divide it into sections, each of which may be regarded as a subgenus of *Isocrinus* if not as a full genus. One such section will undoubtedly comprise the forms herein discussed. In that event the validity of *Balanocrinus* itself will not be settled by the variations or growth-stages of this Cretaceous-Tertiary assemblage, but by the relationships of the genotype, the Oxfordian *Balanocrinus subteres*; and "that is another story."

XLIX.—*New Indo-Malayan Lepidoptera.*

By Colonel C. SWINHOE, M.A., F.L.S.

Family Euplœidæ.

Salpinx ceramica, nov.

♂. Upperside dark olive-brown, the outer margins paler and somewhat ochreous-tinted: fore wing with a rather large and round bluish spot below the middle of vein 2, with a smaller one immediately below it and seven submarginal bluish spots decreasing in size from the apex downwards: hind wing with the costal space pale; a large ochreous-grey patch covering the upper half of the cell and a space above it, a postdiscal row of obscure dots and another submarginal, the uppermost one most pronounced. Underside: fore wing coloured as above; a very large ochreous-grey hinder marginal space which extends to the median vein and a little beyond vein 2; a large round ochreous-grey spot below vein 3 near its base, a small one above it, and a whorl of four

small spots above curling inwards to near the costa; a submarginal row of spots, decreasing in size hindwards, and a marginal row of small spots, the first six from the apex in pairs: hind wing darker than the fore wing, uniform in colour, some small dots at the base; a submarginal complete row of small spots and some spots close to the margin, obsolete on the upper half.

♀. Somewhat paler in colour, the spot-markings above and below larger, those on the underside very prominent.

Expanse of wings, ♂ $3\frac{2}{10}$, ♀ $3\frac{1}{2}$ inches.

Hab. Ceram Island.

The fore wings in the male are shorter and more rounded than is usual in the genus *Salpinx*, giving the insect the appearance of a *Calliploea*.

Family Nymphalidæ.

Cyrestis atosia, nov.

♂. Much the same pattern as *irmæ**, Forbes, from Sumatra; belongs to the *menalis* group, represented in the Indian region by the *nivea*† group figured by Bingham in the 'Fauna of British India,' Butterflies, ii. p. 351 (1905); but Bingham has figured *nivalis*‡ of Felder, from Java, instead of *nivea*, a perfectly distinct species, with a broad black costal border from the base to the apex of the fore wing, type in Coll. Rothschild. In *atosia* the band is similar, but the transverse lines are dark chocolate-brown, the costal band of the fore wing is complete and contains three white spots—one subapical, the others on each side of it; the marginal band is broader, its inner edge is bent in a curve between veins 5 and 3, the edges of the bend connected together by a thick transverse line, and there is a white streak near the hinder angle above the orange-ochreous patch; the hind wing is marked much as in *nivea*, except that the white streak in the marginal band from the apex downwards is much narrower, the transverse lines on both wings thicker and more prominent, the short bands downwards from the costa of fore wing broader and more complete, the outer one fining to a point on vein 4, the middle one across the cell, and a subbasal one which crosses the wing and is continued across the hind wing to the orange-ochreous anal patch; the

* 'A Naturalist's Wanderings in the Eastern Archipelago,' p. 274 (1835).

† Zinken-Sommer, Nova Acta Acad. Leop.-Car. 1831, p. 138, pl. xiv. fig. 1.

‡ Reise Nov. Lep. 1886 p. 414.

pattern of both wings much resembles that of *irmæ*, but the coloration of the bands and lines in that species is much broader and more pronounced and nearly pure black.

Expanse of wings 2 inches.

Hab. Maymyo, Burma (*Graham*).

Neptis ancus, nov.

♂. Above and below closely resembling *N. clinia*, Moore, from the Andamans. Upperside with the subapical spots larger, the lower discal spots also much larger, and more uniform in size with those of the transverse band of the hind wing, which is nearly uniform in its entire length, and the submarginal band of the hind wing is pure white and well pronounced. On the underside the cell-streak on fore wing is narrower and the subapical spots are joined together.

Expanse of wings $1\frac{8}{10}$ inch.

Hab. Toungoo, Burma (*Graham*).

Neptis margala, nov.

♂. Upperside black, markings pure white: fore wing with the usual cell-streak running close along the median vein broken at the end, then continued in a narrow spear-shaped form to nearly halfway between the cell-end and the outer margin; two large elongated subapical spots, the upper one the larger; a large round spot in the lower disc, a smaller one below it, inwards; a submarginal line of disconnected lunular marks, the fifth from the costa obliquely placed, a thin line between this and the outer margin, and some white on the black cilia: hind wing with the costal space narrowly white; a broad pure white even band across the wing (with the veins running through it) a little before its middle and in a line with the two lower discal spots of the fore wing; a submarginal thin and even grey band, an indistinct grey line halfway between this and the white band, and another close to the margin. Underside very beautifully marked, the ground-colour uniform dark chocolate-brown, all the markings pure white and clearly cut: fore wing with an unbroken broad streak in and beyond the cell, thickening outwards and rounded at the end, which is then pointed; a thin streak above it ending above the cell-end; the subapical and lower discal spots and marginal lunules and line as above, but the spots are much larger and the lunules and marginal line much thicker, followed by a series of lunular marks close to the margin; the cilia also streaked with white: hind wing with a broad costal streak from the base, narrowing and

ending in a point a little beyond the middle of the costa; a broad and even transverse band, broader than it is on the upperside, a submarginal band about half as broad, and thick transverse lines on each side of it, the entire wing being more white than brown; a faintly indicated white marginal line.

Expanse of wings 2 inches.

Hab. Borneo.

Allied to nothing I know of.

Pantoporia mera, nov.

♂. Belongs to the *inara* group, is smaller, the fore wing shorter, the outer margin is less concave, the pattern on the upperside is very similar, but the cell-streak is more attenuated, the white spot in it smaller, the orange submarginal band incomplete, narrower at the apex, then broken, a spot in continuation on the middle, and faint indications of a grey line downwards to the hinder angle. The underside, however, is very different to the underside of *inara*, especially on the hind wing, the middle white band being more even, not attenuated to a point at the abdominal fold as it is in *inara*; the black discal row of spots is absent or only very faintly indicated, and the white postdiscal band is broader.

Expanse of wings $2\frac{2}{10}$ inches.

Hab. Borneo.

Family Hesperidæ.

Subfamily *ASTICTOPTERINÆ*.

Genus *TECUPA*, nov.

Forewing: vein 12 ends on costa opposite the end of the cell, 11 evenly free from 12, emitted one-third from upper end of cell, 10 from near the end; 9, 8, 7 emitted close together at and round the end; discocellulars faint, inwardly oblique, 5 from the middle, 3 from one-fourth before lower end of cell, 2 from before the middle; costa evenly and highly arched, apex subacute, outer margin convex below the apex, then obliquely straight to the hinder angle. Hind wing: vein 8 much bowed, ends near the apex of the wing; cell short and broad, less than half the length of the wing; vein 7 from upper end of cell; discocellulars obsolete; vein 5 faint, from the middle; 3 from lower end of cell, 2 from near the end; costa and outer margin evenly rounded; palpi porrect, third joint thick, produced and obtuse, the entire palpi thickly covered with long bristly hairs; antennæ

slender, club gradual, pointed and slightly bent, about half the length of the costa of fore wing; legs slender and naked; abdomen slender, extending a little beyond the wings.

Type, *T. curiosa*, mihi.

Tecupa curiosa, nov.

♂. Chocolate-black, very dark and very black in some lights and above and below very uniform in colour, with the veins above and below rather prominent. On the underside the colour is slightly paler, palest on the outer and hinder margins of the fore wings.

Expanse of wings $2\frac{1}{2}$ inches.

Hab. Naga Hills.

A very curious-looking Hesperid; three male examples received from Major Graham's collection as *Watsoniella swinhoei*, Elwes *, but is certainly generically quite different.

Family Arctiidae.

Amsacta annamensis, nov.

♂. Pure white, antennæ and palpi above black; palpi beneath, pectus, fore legs, top of head, and shoulders scarlet; mid and hind legs white, with black and scarlet stripes; tarsi black, ringed with white; collar and costa of fore wing scarlet; fore wing with a small black dot at upper end of cell, hind wing with a small black spot at lower end of cell; in one example there is a black spot on the outer margin above the middle; thorax with a small black dot in front on each side; abdomen dark yellow, with black segmental bands, with black spots in the middle of the first three and last bands and black lateral stripes. Underside: body white; wings as above, but there is a small black subbasal spot on each wing.

Expanse of wings 2 inches.

Hab. Hué, Annam.

Somewhat resembles Hampson's figure of *Amsacta fluvimargo* † from Bhamo, Burma, the unique type in Mus. Genova, but there are many points of difference, besides which the antennæ have not got white tips and the abdomen is yellow, not scarlet as stated in the text, though yellow in the plate; it also resembles a spotless *lactinea* of Cramer.

* Trans. Zool. Soc. 1897, p. 220, pl. xx. fig. 6.

† 'Lepidoptera Phalaenæ,' iii. p. 327, pl. xlv. fig. 14.

Amsacta barbara, nov.

♀. Antennæ and palpi black, and legs with black and white and crimson stripes; tarsi uniformly black; head, thorax, and wings above pure white; an ochreous-grey stripe on top of head, another on the collar: fore wing with a thin costal pinkish stripe; a black spot on the upper and lower ends of the cell, two black spots close above vein 1, subbasal and postmedial: hind wing with a large black spot at upper end of cell: abdomen above crimson, dorsal and lateral black spots. Underside: wings as above, subbasal black spot on each wing; body pure white; abdomen with black spots down each side.

Expanse of wings $2\frac{6}{10}$ inches.

Hab. Babber Island, south of Ceram.

Amsacta saduca, nov.

♂. Antennæ and palpi black, white beneath; legs yellow, with black stripes; hind tibiæ with white stripes; tarsi black, with white rings; head, thorax, and wings pure white, a faint pinkish line across the base of the head: fore wing with a pinkish costal line; a row of three or four black subbasal spots, one at the upper end of the cell, and a discal row, commencing with three or four in a line from the costa rather near the apex, then obliquely to the middle of the hinder margin, and one or two spots at the hinder angle: hind wing with a large black spot almost closing the end of the cell, and from two to four subterminal spots: abdomen ochreous, with dorsal black stripes and lateral black spots, the ventral segment with a centre black spot. Underside: wings as above; a subbasal black spot on each wing; body pure white.

Expanse of wings $1\frac{1}{2}$ inch.

Hab. Cuddapah, Madras Presidency.

Spotted much as in *A. albistriga*, Walker, xxxi. p. 303 (1864), well figured by Hampson in Phal. iii. p. 330, pl. xlv. fig. 19 (1901), but the fore wing of that species is pale brown, with longitudinal white stripes.

L.—*Descriptions of new Frogs of the Genus Rana.*

By G. A. BOULENGER, F.R.S.

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Rana phrynoides.

Vomerine teeth in small oblique groups just behind the choanae. Head much broader than long, much depressed; snout rounded, scarcely projecting beyond the mouth, as long as the eye; canthus rostralis indistinct; loreal region very oblique, slightly concave; interorbital space narrower than the upper eyelid; tympanum hidden or very indistinct, $\frac{1}{2}$ to $\frac{2}{3}$ the diameter of the eye. Fingers obtuse, first longer than second; subarticular tubercles small, moderately prominent. Hind limb short, the tibio-tarsal articulation reaching the shoulder or the temple, the heels just meeting when the limbs are folded at right angles to the body; tibia $2\frac{1}{3}$ to $2\frac{1}{2}$ times in length from snout to vent. Toes short, with obtuse tips, entirely webbed; subarticular tubercles small, moderately prominent; a feeble tarsal fold; inner metatarsal tubercle narrow, feebly prominent, $\frac{1}{2}$ the length of the inner toe; no outer tubercle. Upper parts granular, with numerous small warts on the back, some of which may be elongate; these granules and warts may bear black horny spinules; a strong fold across the head behind the eyes, and a very strong glandular fold from the eye to the shoulder; lower parts smooth. Dark olive above, uniform or with rather indistinct darker spots; lips with or without dark vertical bars; dark cross-bars on the limbs very irregular, if present; lower parts whitish, uniform or throat and limbs spotted or marbled with blackish. Male with internal vocal sacs; during the breeding-season the arms are remarkably thickened and black horny spines form two patches on the breast and more crowded patches on the inner metacarpal tubercle and on the upper side of the two inner fingers.

From snout to vent 110 mm.

Yunnan at Tongchuan fu, where the species was found in great numbers by Messrs. J. Graham and Dymond.

I had first referred these specimens to *R. boulengeri*, Gthr., which is no doubt identical with the earlier *R. spinosa*, David. I now find they differ in the shorter hind limbs, the heels not overlapping, in the shorter inner metatarsal tubercle, and in the absence of swellings to the tips of the toes.

Rana tibetana.

Vomerine teeth in small oblique groups between the choanæ and extending a little beyond the level of their posterior borders. Head much broader than long, much depressed; snout rounded, shorter than the eye, scarcely projecting beyond the mouth; canthus rostralis distinct; loreal region very oblique, concave; interorbital region much narrower than the upper eyelid; tympanum distinct, $\frac{3}{4}$ the diameter of the eye. Fingers obtuse, first slightly longer than second; subarticular tubercles moderate. Hind limb moderately long, the tibio-tarsal articulation reaching the anterior border of the eye, the heels strongly overlapping when the limbs are folded at right angles to the body; tibia twice in length from snout to vent. Toes with the tips swollen into small disks, entirely webbed; subarticular tubercles moderate; a very distinct tarsal fold; inner metatarsal tubercle narrow, feebly prominent, $\frac{5}{8}$ the length of the inner toe; no outer tubercle. Upper parts rough with granules and numerous round or oval warts tipped with black horny spinules; a feeble fold across the head, behind the eyes; a strong glandular fold from the eye to the shoulder; lower parts smooth. Brown above, with numerous ill-defined dark spots on the back and cross-bars on the limbs, the larger warts lighter; a light cross-bar between the eyes; lips with dark vertical bars; lower parts brownish, throat and limbs mottled with brown. Male with internal vocal sacs; arms thick; breast with black horny spines; similar spines, but more crowded, on the inner metacarpal tubercle and on the upper surface of the two inner fingers.

From snout to vent 61 mm.

A single male specimen from Yin tsin wau, Wassu State, Tibet.

Distinguished from *R. gammiei*, And., by the distinct tympanum, the presence of a tarsal fold, the larger metatarsal tubercle, and the presence of vocal sacs; from *R. feæ*, Blgr., by the swollen tips of the toes and the distinct canthus rostralis; from *R. yunnanensis*, And., by the less prominent metatarsal tubercle (*vide* Anderson); from *R. rugosa*, Schleg., by the broader head, the larger metatarsal tubercle, and the presence of vocal sacs.

Rana macrognathus.

I now regard as deserving specific distinction the frog from Upper Burma referred by me to *R. dorice*, Blgr. (Ann. Mus. Genova, [9] xiii. 1893, p. 328, pl. viii. fig. 1), the

males of which differ in the very large head with strong swellings on the lower surface of the mandible and on each side of the occiput, and in the presence of a strong tooth-like process on each mandibular ramus, near the symphysis, as in *R. kuhlii* and *R. macrodon*. In these males, when fully developed, the interorbital region is broad and very convex, the swelling produced posteriorly as in *Pelobates fuscus*, and the tympanum is quite as large as or even larger than the eye. Females are hardly distinguishable from *R. dorice*.

From snout to vent 57 mm.

The types are from the Karin Hills, Upper Burma, 1300 to 1600 feet, and from the district of the Karin Bia-po, collected by the late L. Fea.

R. macrognathus is intermediate between *R. dorice*, Blgr., and *R. pileata*, Blgr., and nearer the latter, which differs in the dermal flap on the head of the males and in the usually smaller inner metatarsal tubercle.

Rana grahami.

Vomerine teeth in transverse or slightly oblique series between the choanæ or extending a little beyond the level of the posterior borders of the latter. Head as long as broad or a little broader than long, much depressed; snout rounded or obtusely pointed, feebly or rather strongly projecting beyond the mouth, as long as the eye or a little shorter; canthus rostralis obtuse; loreal region feebly oblique, concave; interorbital region narrower than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ to $\frac{3}{5}$ the diameter of the eye. Fingers rather long, the tips feebly swollen, first as long as or a little longer than the second; subarticular tubercles moderate. Tibio-tarsal articulation reaching the tip of the snout or a little beyond; heels overlapping when the limbs are folded at right angles to the body; tibia $1\frac{2}{3}$ to $1\frac{7}{8}$ times in length from snout to vent, shorter than the fore limb, as long as or a little longer than the foot. Toes with the tips slightly swollen, entirely webbed; subarticular tubercles rather small; no tarsal fold; inner metatarsal tubercle feebly prominent, $\frac{1}{3}$ to $\frac{2}{3}$ the length of the inner toe; no outer tubercle. Skin smooth above or finely corrugated, often with large flat warts on the back; sides granular with large warts, some of which may bear minute white spinose tubercles; a broad glandular dorso-lateral fold sometimes present, but much broken up; one or two large glands behind the angle of the mouth; lower parts smooth or posterior part of belly granular. Olive above, with more or less distinct darker spots and often

speckled or mottled with black; sides yellow, with large black spots or marblings; limbs with numerous dark cross-bands, which may be broken up into spots or marblings; hinder side of thighs yellow, spotted or marbled with black; lower parts white, throat and breast sometimes spotted with blackish. Male with internal vocal sacs; fore limb much thickened; inner finger with a large pad, covered during the breeding-season with a velvety yellowish or greyish horny layer.

From snout to vent 102 mm.

Yunnan at Yunnan fu; numerous specimens from the collection of Mr. J. Graham.

This species is very similar to *R. andersoni*, Blgr., with which I had at first confounded it; but the absence of disks to the fingers and toes readily distinguishes it.

Rana tarahumaræ.

Vomerine teeth in small oblique groups just behind the level of the posterior borders of the choanæ. Head much depressed, broader than long; snout rounded, feebly projecting beyond the mouth, as long as the eye; canthus rostralis very obtuse; loreal region very oblique, slightly concave; nostril equidistant from the eye and from the tip of the snout; tympanum distinct, $\frac{2}{3}$ to $\frac{1}{2}$ the diameter of the eye. Fingers with feebly swollen tips, first longer than second; subarticular tubercles moderate. The tibio-tarsal articulation reaches the tip of the snout or between the eye and the tip of the snout; heels meeting when the limbs are folded at right angles to the body; tibia $1\frac{1}{2}$ to 2 times in length from snout to vent. Toes with the tips swollen into very small disks, the base of which is involved in the very broad web; no tarsal fold; a feebly prominent, elliptic inner metatarsal tubercle, measuring $\frac{1}{3}$ to $\frac{2}{3}$ the length of the inner toe; no outer tubercle. Skin smooth, or upper parts with small pustules; a feeble curved glandular fold from the eye to the shoulder; no dorso-lateral fold. Brown or olive above, with small blackish spots or numerous dots; limbs with irregular dark cross-bands; lower parts white, uniform or throat, breast, and limbs mottled with greyish brown. Male without vocal sacs, with a thick blackish pad on the inner side of the first finger.

From snout to vent 77 mm.

Several specimens, from Iquiro and Barranca del Cobre, Sierra Tarahumaré, N.W. Mexico, form part of a collection presented by Dr. H. Gadow a few years ago. I had

referred this frog to *R. pustulosa*, Blgr., from which it differs by the more broadly webbed toes and the absence of a dorso-lateral glandular fold. The larger eye, the more oblique loreal region, the more distinct tympanum, the shorter tibia, and the absence of vocal sacs distinguish it from *R. boylii*, Baird.

Rana floweri.

Vomerine teeth in very short oblique series close to the anterior corners of the choanæ. Head much depressed, as long as broad; snout pointed, projecting, slightly longer than the eye; canthus rostralis rounded; loreal region very oblique, slightly concave; interorbital space much narrower than the upper eyelid; tympanum very distinct, $\frac{2}{3}$ the diameter of the eye. Fingers short and obtusely pointed, first and second equal; subarticular tubercles moderate. Hind limb short, the tibio-tarsal articulation reaching the tympanum, the heels feebly overlapping when the limbs are folded at right angles to the body; tibia $2\frac{1}{2}$ times in length from snout to vent, slightly longer than the foot. Toes short, obtusely pointed, $\frac{2}{3}$ webbed, 2 phalanges of fourth and $\frac{1}{2}$ a phalanx of fifth free; subarticular tubercles small and feebly prominent; an oblique fold on the inner side of the tarsus; inner metatarsal tubercle oval, moderately prominent, $\frac{1}{2}$ the length of the inner toe; a small flat outer tubercle. Skin smooth above, with feebly prominent, interrupted, glandular longitudinal folds, 4 on the occipital region and 6 on the body; a stronger and continuous dorso-lateral glandular fold; a glandular fold from below the eye to above the arm; sides and posterior part of belly and base of lower surface of thighs granular. Grey above, with large dark spots forming rather irregular transverse series, the dorso-lateral fold whitish; a V-shaped dark marking between the eyes; a dark streak from the end of the snout to the eye and a large dark temporal spot; a white streak from below the eye to the shoulder, followed by a round white spot; limbs with regular dark cross-bands; hinder side of thighs with dark marblings and a light longitudinal streak; lower parts white. Male with blackish external vocal sacs projecting through a slit on each side of the throat, parallel with and close to the ramus of the mandible.

From snout to vent 45 mm.

A single male specimen from Rosaires on the Blue Nile, obtained by Capt. S. S. Flower and presented by him to the British Museum in 1909.

Closely allied to *R. mascareniensis*, D. & B.; distinguished by the stouter and shorter hind limbs.

By an unfortunate oversight, the frog recently described by me in these 'Annals' (vol. xix. p. 407) as *R. leonensis* is stated to be from Sierra Leone; it was obtained by Dr. Spurrell at Bibianaha, Gold Coast.

LI.—New Genera and Species of Brisingidæ*.

By WALTER K. FISHER, Stanford University, California.

THE new genera of starfishes of the family Brisingidæ which are described in this paper are partly derived from an analysis of *Brisinga* and *Freyella* of authors and partly from new species dredged by the U.S. Fisheries Steamer 'Albatross' in the East Indies and in the North Pacific. *Craterobrisinga* and *Stegnobrisinga* have already been proposed as subgenera, but a further study of the material has convinced me that they are good generic groups.

The complete diagnosis of any genus in the following synopsis is obtained by starting with the *a* which heads the particular section in which the genus is found and reading each pertinent section until the genus is reached. For example, the account of *Brisinga* is contained in paragraphs *a*³, *b*², *c*², *d*¹, *e*¹, *f*¹, *g*¹; that of *Gymnobrisinga* in paragraphs *a*³, *b*¹; that of *Astrocles* in *a*³, *b*², *c*², *d*², *e*²; and so on.

It is hoped that this preliminary account will be of use to my colleagues. Any corrections, or information regarding the generic position of known species of "*Brisinga*" and "*Freyella*," will be gratefully received.

Synopsis of the known Genera of Brisingidæ.

- a*¹. Abactinal surface of disk and genital region of ray provided with numerous conspicuous papulæ; two gonads to each ray; mouth-plates broad and fan-shaped toward actinostome, nearly closing the entrance to the ambulacral furrow; genital region of ray with transverse skeletal arches, between which the integument is strengthened by immersed plates and pierced by papular

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pores; ray with regularly spaced, lateral, transverse combs of upward of seven conspicuous slender spines; adambulacral plates higher than long, with a single prominent subambulacral spine, frequently truncate and more or less spatulate proximally; first 3 to 5 pairs of adambulacral plates united in each interradius, and above them the marginal plates are similarly united; a syzygy (non-muscular symphysis) between first and second adambulacral plates, and also sometimes a partial syzygy between the second and third and between the third and fourth plates. Genotype, *Brisinga semicoronata*, Perrier

Odinia, Perrier.

- a*². A single circle of rather small papulæ near margin of disk, 2 papulæ corresponding to each ray; rays, as in *Brisinga*, without papulæ. First and second adambulacral plates united by a syzygy (non-muscular symphysis), and upper part of second and third ambulacral plates united by syzygy; gonads numerous, in series; first pair of adambulacral plates in each interbrachium closely united (as in figs. 3 and 4). Genotype, *Brisinga mimica*, Fisher

Brisingenes, Fisher.

- a*³. No papulæ present either on disk or on rays.

- b*¹. No abactinal skeleton on rays, the dorsal side of arm being composed of integument without plates but covered with numerous, relatively large pedicellariæ arranged in transverse bands.* Genotype, *Gymnobrisinga sarsii*, Studer . . .

Gymnobrisinga, Studer.

- b*². Abactinal skeleton present on disk, and on proximal portion of rays at least.

- c*¹. Disk-plates large, with a comparatively few fairly large disk-spines, and a vertical series of about four conspicuous lateral spines to each successive skeletal arch of the rays, these lateral combs occurring at regular intervals all along side of ray; mouth-plates expanded fan-wise toward actinostome, nearly closing entrance to ambulacral furrow; subambulacral spine with a modified truncate tip; first pair of adambulacral plates of each interbrachial angle united, but the united pair of conspicuous first marginal plates is interpolated from above between their distal ends; syzygy (?); related to *Odinia*. Genotype, *Brisingaster robillardii*, de Loriol.

Brisingaster, de Loriol.

* *Hymenodiscus*, Perrier, belongs under this section. It is founded upon a very immature specimen, possibly a young *Brisinga*.

c². Disk-plates small, bearing one to several small spinelets; on the ray there is only one lateral or marginal spine corresponding to the variably spaced inferomarginal plates, never a vertical comb of conspicuous lateral spines.

dⁿ. First and second adambulacral plates as well as the upper part of the second and third ambulacral plates united by syzygy (non-muscular symphysis).

e¹. Abactinal skeleton of rays in the form of independent, spaced arches or costæ composed of elongate, more or less compressed, overlapping plates, projecting well

Fig. 1.



Fig. 2.

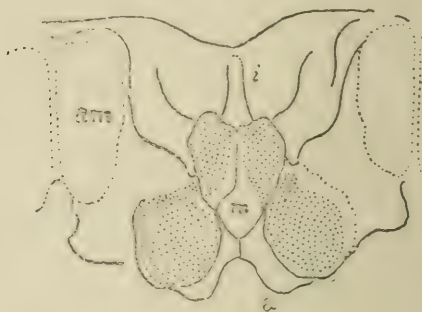


Fig. 1.—*Brisinga trachydiscæ*. Oral angle from actinal side.

Fig. 2.—Ditto. Lateral view of interbrachium, rays removed.

In all figures: *a*, first adambulacral plate; *am*, ambulacral plate; *i*, interradial plate; *m*, marginal plate; *o*, mouth-plate.

above the level of the intervening integument and bearing small spinelets; intercostal integument not fortified by thin, immersed, spineless, fenestrated plates.

f¹. Gonads numerous, in a series along either side of each ray; the interradial (first) pair of adambulacral plates is joined by the interradial faces, and above them is a united pair of first marginal plates—four in all (figs. 1 and 2).

g¹. Subambulacral spines of proximal adambulacral plates

slender, acicular; the accessory subambulacral spine, if present, is on the adoral half of the plate; adambulacral armature is not dense and crowded. Genotype, *Brisinga endecacnemus*, Asbjørnsen.

Brisinga, Asbjørnsen.

- g*². Subambulacral spines of proximal adambulacral plates with modified, capitate, often truncate tips; second subambulacral spine regularly present, prominent, and near the aboral end of plate; adambulacral plates short, with crowded armature. Genotype, *Brisinga panopla*, Fisher

Craterobrisinga, Fisher.

- f*². Gonads two to each ray (one on each side); subambulacral spines all delicate and acicular.

- g*¹. The interradial (first) pair of adambulacral plates is joined by the interradial faces, and above them is a united pair of first marginal plates—four in all (figs. 3 and 4). Genotype, *Brisinga moluccana*, Fisher

Astrostephane, Fisher.*

- g*². The interradial (first) pair of adambulacral plates is not joined, but separate, the outer end of the combined mouthplates being usually interpolated between the inner ends of these adambulacral plates; first pair of marginal plates is not closely united by the interradial faces, but only by the adoral ends, to which also is closely united the lower end of the interradial plate, forming a rude reversed Y, of which the angle is the apex of the interbrachial angle and the arms are the first marginal plates (figs. 5 and 6); adambulacral plates slender,

* Includes also *Astrostephane acanthogenys* (Fisher), from 172 fathoms off Lingayau Gulf, Luzon. The type is from 265 fathoms between Gillolo and Kayoa Islands, Molucca Islands. (Fisher, Proc. Biol. Soc. Washington, vol. xxix, p. 33, Feb. 24, 1916.)

Fig. 3.

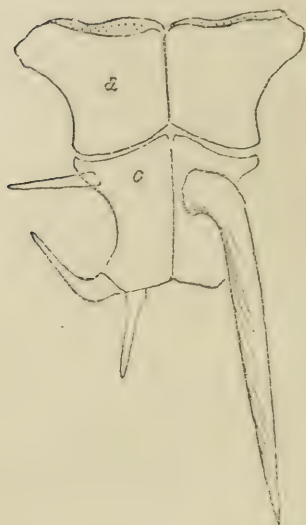
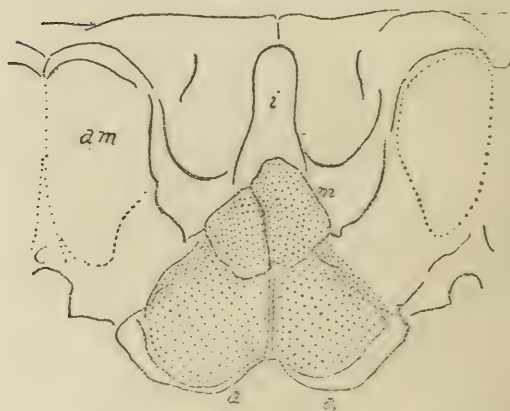
*Astrostephane moluccana*. Oral angle actina view.

Fig. 4.

*Astrostephane moluccana*.
Lateral view of interbrachium, rays removed.

with delicate subambulacral spine; rays delicate, very deciduous. Genotype, *Brisinga fragilis*, Fisher

Brisingella, isher.

- e*². Abactinal skeleton of rays consisting of independent, compressed arches or costæ as in *Brisinga*, but the integument between the arches is crowded with numerous spineless, immersed, fenestrated, thin plates, sometimes slightly overlapping, yet leaving the integument quite inflexible; gonads 2 or 4 to each ray.
- f*¹. First pair of adambulacral plates united, and joined to their upper side is a united pair of marginal

Fig. 5.

Fig. 6.

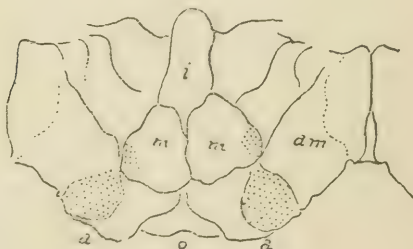
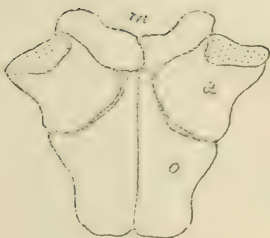


Fig. 5.—*Brisingella fragilis*. Oral angle, actinal view.

Fig. 6.—Ditto. Lateral view of interbrachium, rays removed; only the articular surface of the adambulacrals and marginals is dotted.

plates, four in all, as in *Brisinga*; proximal adambulacral plates higher than long; gonads two to each ray. Genotype, *Brisinga* (*Stegnobrisinga*) *placoderma*, Fisher

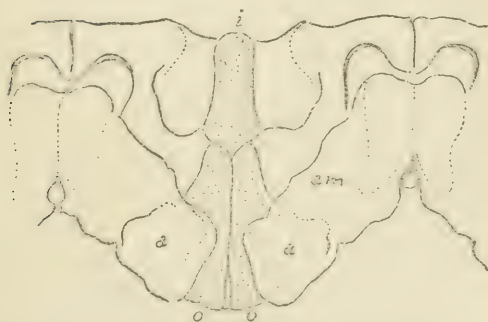
Stegnobrisinga, Fisher.

- f*². First pair of adambulacral plates not joined together by the interradial faces, but separate; first pair of marginal plates not closely united by their interradial faces, but only by the adoral ends, to which also is closely united the lower end of the interrarial plate, forming a rude Λ , of which the angle is the apex of the interbrachial angle

- and the arms are the first marginal plates (figs. 5 and 6); proximal adambulacral plates not higher than long; gonads 2 or 4 to each ray. Genotype, *Brisinga panamensis*, Ludwig. *Astrolirus*, Fisher.
- e*³. Abactinal skeleton of genital region of ray composed of a uniform armour of thin, spiniferous, more or less overlapping plates, but not of independent arches or costæ.
- f*¹. Primary plates of disk much larger than the others, which are small; gonads 2 to each ray; an interrarial plate, vertical in position, is interpolated between the proximal ends of the first adambulacral plates, and touches the mouth-plates, but does not encroach upon the actinal surface as in *Colpaster*. Genotype, *Belgicella racovitza*, Ludwig. *Belgicella*, Ludwig.
- f*². Primary plates of disk not conspicuous and not distinguishable from the other abactinal plates of disk.
- g*¹. An azygous interrarial plate, shield-shaped and conspicuous superficially on the actinal surface, separates the first pair of free adambulacral plates; gonads unknown. Genotype, *Colpaster scutigerulus*, Sladen. *Colpaster*, Sladen.
- g*². First pair of adambulacral plates not separated by an azygous plate, but united as in *Brisinga*, and above them is a pair of conspicuous, united, first marginal plates—four in all in each interrarial angle; gonads numerous, in a series along either side of the ray. Genotype, *Freyella spinosa*, Perrier. *Freyella*, Perrier.
- d*². No syzygy, or non-muscular symphysis, between the first and second adambulacral plates nor between the upper part of the second and third ambulacral plates, but a normal muscular symphysis not different from the others; no marginal plates directly above the first pair of adambulacral plates; the latter are not united except sometimes by the proximal ends; touching the

lower end of the interradial plate is a pair of very inconspicuous plates lying in the same plane, and superficially appearing to be a part of the interradial plate*. These are really the outer ends of the mouth-plates which project dorsally behind the first pair of adambulacral plates. The latter, by sometimes touching at their inner ends, segregate this dorsal portion of the mouth-plates from the actinal spine-bearing part. For this reason they may easily be mistaken for two entirely independent plates (see fig. 7).

Fig. 7.



Freyellidea microplax. Lateral view of interbrachium; the surface of the interradial and mouth-plates is dotted.

- e*¹. Abactinal skeleton of ray composed of a uniform armour of thin, spiniferous, more or less overlapping plates as in *Freyella*, not of spaced, independent arches or costæ; furrow spinelets not modified or expanded at the tip. Genotype, *Freyellidea microplax*, Fisher *Freyellidea*, Fisher.
- e*². Abactinal skeleton of ray consisting of independent transverse arches, composed, on radial area,

* The interradial plate described by Ludwig in *Belgicella* is perhaps the true interradial plate plus these extreme outer ends of the mouth-plates, which, unless treated with potash, appear to be a part of the interradial plate. (Ludwig 'Belgica' Report, 1903, p. 60).

of flattened, overlapping plates (not of elongate, narrow, more or less compressed ossicles as in *Brisinga*); these costæ bear spinelets and are separated by intervals devoid of plates; furrow spinelets with curiously modified expanded tips. Genotype, *Astrocles actinodetus*, Fisher *Astrocles*, Fisher.

Genus BRISINGA, Asbjørnsen.

Brisinga, Asbjørnsen, Fauna Litt. Norvegiæ, 1856, andet hefte, p. 95. Type, *B. endecacnemus*, Asbj.

Admirable figures are given by G. O. Sars in his monograph of *Brisinga coronata* (pl. viii.). *Brisinga trachydisca* is the only species of the restricted genus *Brisinga* that I have examined. It was dredged by the steamer 'Albatross' in 602 to 772 fathoms in the Philippine Islands.

Genus CRATEROBRISINGA, Fisher.

Craterobrisinga, Fisher (subgenus), New East Indian Starfishes, Proc. Biological Soc. Washington, vol. xxix. p. 33 (Feb. 24, 1916). Type, *Brisinga panopla*, Fisher.

The species which are to be included in this group are: *Craterobrisinga panopla* (Fisher), *C. parallela* (Kœhler), *C. alberti* (Fisher), *C. cricophora* (Sladen), *C. eucoryne* (Fisher), *C. variispina* (Ludwig), *C. multicostata* (Verrill), *C. evermanni* (Fisher), aberrant.

Craterobrisinga synaptoma, sp. n.

Diagnosis.—Rays 12, 14, and 15, with very long genital area crossed by 35 to 40 irregular, fairly well-spaced, complete and incomplete prominent, spiniferous costæ; genital region equal to about 8.5 to 10 *r*, or .6 total length of ray; disk with prominent spinelets, solitary except on primary radial plates, about 1 mm. long; no disk pedicellariæ; adambulacral plates short and broad, with proximally usually 2 aboral furrow spinelets and 2 subambulacral spines all in a transverse series, and sometimes also a furrow spinelet on the proximal half of plate; first 10 or 12 outer subambulacral spines with circular, enlarged, sharply truncate tip; mouth-plates decidedly small, with 2 or 3 actinostomial spinelets, and on the outer part of plate a transverse series consisting of 1 or 2 aboral furrow spinelets and 1 tapering suboral spine; first 2 adambulacral plates of each ray fused to those of

adjacent ray by a non-muscular articulation. $R=200 +$ mm., $r=15$ mm. (14 rays); $R=245$ mm., $r=13$ mm. (12 rays).

Type-locality. — 'Albatross' station 3342, off British Columbia, $52^{\circ} 39' 30''$ N., $132^{\circ} 38'$ W., 1588 fathoms, grey ooze, coarse stones, bottom temperature $35^{\circ}.3$ Fahrenheit.

Craterobrisinga synaptoma is characterized by the very long genital region and the numerous, irregular, uncrowded costæ. The first two adambulacral plates of each ray are joined to the corresponding plates of the adjacent ray, instead of only the first plate as in other species of the genus. The smaller of the two subambulacral spines at the base of the ray has the tip slightly, or sometimes conspicuously, thickened and modified.

BRISINGENES, gen. nov.

Diagnosis.—As given in foregoing synopsis.

I know of only two species which are referable to this genus—the type, *B. mimica*, Fisher, from 559 fathoms, Buton Strait, Celebes, and *B. anchista*, sp. n., from the same station. In general appearance these species closely resemble typical *Brisinga*, but differ in having a circle of papulæ close to the margin of disk, two corresponding to each ray.

BRISINGELLA, gen. nov.

Diagnosis.—As given in foregoing synopsis.

This genus includes the following species: *B. fragilis* (Fisher), type, *B. coronata* (G. O. Sars), *B. exilis* (Fisher), *B. tenella* (Ludwig), and probably also the following species described by Sladen: *B. verticillata*, *B. armillata*, *B. discincta*, and *B. membranacea*. *B. mediterranea* (Perrier) is also very probably a member of this genus. Without definite information concerning the gonads it is not possible to be certain.

In his paper entitled "Researches on the Structure and Affinity of the Genus *Brisinga*, &c.," George Ossian Sars describes and beautifully figures the anatomy of *Brisingella coronata*, a typical species of this genus. The special differential characters are clearly shown on plates iii., iv., and v.

Brisingella pusilla, sp. n.

Diagnosis.—Rays 10. $R=165 +$ mm., $r=8$ mm., $R=20+r$; thickness of disk 2.5 mm.; breadth of ray at base 4 mm. Similar in general appearance to *B. exilis*, Fisher,

with thin disk and deciduous, slender, flexible rays, thin delicate abactinal integument, and very fragile spines. Differing from *B. exilis* in having 25 to 30 costæ which extend at least *three-fourths the length of ray*, comparatively few, widely spaced, embryonic, abactinal disk-plates bearing 1 or occasionally 2 small spinelets, a narrower, keeled, inter-radial plate; second ambulacral ossicle more than half as long as the first, measured on the summit of the ridge; furrow spinelet absent beyond the proximal 3 to 14 adambulacral plates.

Type-locality.—‘Albatross’ station 4427, off Point San Pedro, Santa Cruz Island, California, 447 to 510 fathoms, black mud.

Genus STEGNOBRISINGA, Fisher.

Stegnobrisinga, Fisher (subgenus), New East Indian Starfishes, Proc. Biological Soc. Washington, vol. xxix. p. 33 (Feb. 24, 1916). Type, *Brisinga* (*Stegnobrisinga*) *placoderma*, Fisher.

Diagnosis.—As given in foregoing synopsis.

The numerous prominent costæ will at once separate this genus from *Freyella* and *Freyellidea*. The genus *Astrolirus* differs in having the first adambulacral plates and first marginal plates arranged as in *Brisingella*, and in having slenderer adambulacral plates, which, proximally, are not higher than long.

Brisinga gracilis, Kœhler, may be a *Stegnobrisinga*, but certain necessary anatomical details are not yet known—for example, the number of gonads.

ASTROLIRUS, gen. nov.

Diagnosis.—As given in foregoing synopsis.

The type, *Brisinga panamensis*, Ludwig, is the only species known. The genus has much the same relation to *Stegnobrisinga* that *Brisingella* bears to *Brisinga*, with the exception of the gonads, which are two to each ray in *Stegnobrisinga*, and two, or as many as four in very large examples, in *Astrolirus*.

Genus FREYELLA, Perrier, restricted.

Freyella, Perrier, Ann. sci. nat., Zool. vol. xix. art. 8, 1885, p. 5. Type, *Freyella spinosa*, Perrier, first species.

Diagnosis.—As given in foregoing synopsis.

This group includes those species of the old genus *Freyella* in which the gonads are numerous and arranged in series

along either side of the ray, as in typical *Brisinga*. In this restricted genus *Freyella*, as in the restricted *Brisinga*, the first adambulacral plate is closely united to its fellow of the adjacent ray, at the apex of the interbrachial angle; and immediately above them and joined to their upper sides is a closely apposed pair of marginal plates, the first of a series which extends a variable distance along the base of the ray, just above the adambulacral plates. The adoral end of these first marginal plates abuts against the base of the interradial plate. In some species part of the second adambulacral plate, as well as the first, is joined to its *vis-à-vis*.

The name *Freyella* has been retained for this group because Perrier's figures of *F. spinosa* in the 'Travailleur' and 'Talisman' Report (1894, pl. viii.) seem to indicate that the first pair of adambulacral plates in each interbrachium is united, while the long genital region indicates serial gonads.

Freyella spatulifera, Fisher (Macassar Strait, 901 fathoms), belongs in this group, and probably also *Freyella polycnema*, Perrier. I am uncertain about Sladen's species. I have indicated under *Freyellidea* the species which I believe to be referable to that genus.

FREYELLIDEA, gen. nov.

Diagnosis.—As given in foregoing synopsis.

Although the species of this genus have been considered congeneric with those of the restricted *Freyella*, the two groups are really very different. *Freyellidea* lacks entirely the syzygial joint between the first and second adambulacral plates, and is the only genus except *Astrocles* in which there is no syzygy at the base of the ray. Furthermore, the marginal plates which are present in the interbrachial angle of other genera (except *Astrocles*) are here lacking.

I have examined the following species which belong to *Freyellidea*: *F. elegans* (Verrill), *F. propinqua* (Ludwig), *F. pacifica* (Ludwig), *F. insignis* (Ludwig). Without a knowledge of the gonads and of details of the interbrachium it is not possible to be certain that the following species belong in *Freyellidea*, but, as nearly as one can judge by the figures, they appear to. Such species are: *F. scerradiata* (Perrier), *F. benthophila* (Sladen), *F. fragilissima* (Sladen), *F. heroina* (Sladen), *F. dimorpha* (Sladen), *F. remeae* (Sladen), *F. tuberculata* (Sladen). *F. bracteata* (Sladen) is a synonym of *F. elegans*, according to Professor Verrill.

The following species is the type of the genus.

Freyellidea microplax, sp. n.

Diagnosis.—Rays 12, not deciduous, only moderately long, with a short, swollen genital region about $4r$ in length. Disk closely covered with short spinelets, 4 or 5 to a plate; genital region of ray covered with small, transversely oriented, elliptical, somewhat irregular plates bearing groups of 2 to 8 small spinelets; 19 or 20 plates can be counted across ray at widest part. Short lateral spine opposite alternate adambulacral plates. Adambulacral armature: 1 aboral furrow spinelet, and 1 subambulacral spine, with truncate enlarged tip at base of ray; first adambulacral plates of adjacent rays not fused, the outer end of the mouth-plates intervening; oral armature: 3 actinostomial spinelets and 1 short, sharp, suboral spine. $R=170+r$ mm., $r=10$ mm., $R=17+r$; thickness of disk 4 mm.; width of ray at base 4.5 mm.; breadth of actinostome 13 mm.

Type-locality.—‘Albatross’ station 3342, off British Columbia ($52^{\circ} 39' 30''$ N., $132^{\circ} 38'$ W.), 1588 fathoms, grey ooze and coarse sand, bottom temperature $35^{\circ}.3$ Fahrenheit.

ASTROCLES, gen. nov.

Diagnosis.—As given in foregoing synopsis.

This curious genus agrees with *Freyellidea* in its most important features—the absence of a proximal adambulacral syzygy, absence of marginal plates above the first few adambulacral plates, and the presence of only two gonads to each ray. The differential characters are given in the synopsis. The following species is the type of the genus.

Astrocles actinodetus, sp. n.

Diagnosis.—Rays 11, not very deciduous; disk fairly large, covered with circular plates bearing 1 to 3 spinelets; genital region of ray 3.5 to $4r$ in length, or about one-sixth total length of ray, and crossed by 25 to 27 pretty regular transverse arches of depressed, elliptical, crenulate plates covered with a felting of minute pedicellariæ and bearing small spinelets in transverse series; intervals between arches without plates or pedicellariæ; lateral spine opposite alternate adambulacral, very slender and delicate; adambulacral armature consisting of 1 aboral furrow spinelet with tip greatly broadened and subtriangular in form, and 1 subambulacral spine, those on proximal half or two-thirds of genital region with an enlarged bifid tip; mouth-plates with 3 actinostomial spines, expanded, flattened, and more or less

irregular in form, 1 aboral, modified furrow spinelet, and 1 suboral pointed spine; in interbrachium the first pair of adjacent adambulacral plates touch or join only at their proximal ends—are not fused the whole extent of their external or lateral faces, nor is there directly above them a prominent pair of first marginal plates as in *Brisinga* and *Freyella*, and allies.

Type-locality. — ‘Albatross’ station 2859, off British Columbia ($55^{\circ} 20' N.$, $136^{\circ} 20' W.$), 1569 fathoms, grey ooze, bottom temperature, $34^{\circ} 9$ Fahrenheit.

LII.—On Three new Parasitic Acari.

By STANLEY HIRST.

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Family Listrophoridæ.

The curious new mite briefly described below lives on the guinea-pig, being found on the hairs of the posterior part of the back. It is a minute species, and this is no doubt the reason why it has hitherto escaped notice. The mite clasps a hair of the host with its anterior legs, which are specially modified for this purpose. During copulation the male attaches himself to the generative nymph by the little suckers on the venter and also by the elongated legs of the fourth pair, the hook of the tarsus becoming fixed in the projecting posterior margin of the second epimeron. Whilst copulating the heads of both male and nymph point in the same direction, instead of in opposite directions as in the genus *Schizocarpus*.

CHIRODISCOIDES, gen. nov.

Anterior legs modified so as to form clasping-organs as in *Chirodiscus*, Trouess. & Nu., but a small pulvillus is present on the tarsi of these limbs. Fourth leg of male longer than the others, and its tarsus is bent at the end to form a hook. Body of the male not bifid at the end as is the case in *Chirodiscus*, but produced into a short unpaired process. There are no long hairs on the body.

Chirodiscoides cavice, sp. n.

Body of ovigerous female narrow and elongated, being

more than three times as long as wide; the dorsal surface is convex. Anterior portion of body bearing the two first pairs of legs strongly chitinated; dorsally it is covered by two strong plates, the anterior one being small and trapezoidal in shape and considerably longer than wide. More than half the rest of the dorsal surface is covered by a thin chitinous plate, the posterior end of which is truncated. Venter and uncovered part of dorsal surface striated, the striations being transverse except on the anterior part of the venter, where they run obliquely. Numerous minute denticles with their points directed backwards are present on the ventral surface of the abdomen. There are only a few hairs on the body, and they are all very fine and short.

Capitulum large and triangular in shape, the apex pointing forwards; the greater part of this structure is formed by the palps, especially by the second segments, which are strongly salient laterally.

Legs.—The two first pairs of legs are rather wide and considerably flattened; tarsus of these limbs grooved below and furnished with a distinct curved knob, besides smaller protuberances. Although reduced in size, the pulvillus is present on the tarsi of these legs. Posterior legs slender and with the pulvillus large. Hairs on legs few in number and mostly short and inconspicuous, but there is a long fine tactile hair at the distal end of the third tarsus.

Generative nymph much smaller and less elongated than the ovigerous female. A longitudinal series of minute curved lobes or scales runs down the middle of the dorsal surface, coming to an end a little distance from the posterior end. The series is really a double one, the lobes of each side facing one another, and each bearing a thin backwardly directed spine. These lobes arise from the inner end of the oblique striations present on the body.

Male a little smaller than the generative nymph. Posterior end of body produced, forming a distinct process or tail (which is much shorter than the tail-like process present in the male nymph); this process is slightly rounded at the end. There is a pair of minute suckers on the venter just in front of the posterior end of the body. Genital aperture placed opposite the proximal segments of the last pair of legs. The three anterior pairs of legs are very similar to those of the female, but the last pair are considerably longer than the others, and the tarsus is bent so as to form a hook; a small pulvillus is present on this modified tarsus, and also a fairly long and blunt hair or seta.

The male *deutonymph* has a fairly long and slender posterior process or tail, which is furnished with minute denticles resembling those found on the venter. There is a double longitudinal series of scales running along the median line of the dorsal surface as in the generative nymph and larva. Besides this central series there are also numerous scattered scales on the dorsal surface.

Protonymph.—A smaller nymph with a much shorter tail than the male *deutonymph* also occurs; presumably it is the *protonymphal* stage.

Larva.—The two anterior legs are modified to form clasping-organs, as in the other stages; the third pair of legs is slender and not modified. There is a very short but distinct curved hook-like tail or process at the posterior end of the body.

Ova.—The eggs are attached singly by one end to a hair of the host; they are narrow and elongated.

Material.—Numerous specimens were found on the two guinea-pigs examined.

Measurements.—Length of ovigerous female $\cdot 46$ – $\cdot 51$ mm., of generant nymph $\cdot 39$ mm., of male $\cdot 35$ mm., of male *deutonymph* (incl. caudal process) $\cdot 46$ mm., of *protonymph* $\cdot 31$ mm., of larva $243\ \mu$, of ovum $210\ \mu$. Width of ovigerous female $150\ \mu$, of generant nymph $160\ \mu$, of ovum $54\ \mu$.

Family Demodecidae.

Genus DEMODEX, Owen.

In his valuable papers* on the genus *Demodex* Friedrich Gmeiner gives a list of the fourteen described species and also the literature, recording a hundred papers on this subject. Two new forms from the hedgehog and dormouse are described below.

Demodex muscardini, sp. n.

♀.—This *Demodex* is a short form and very like that of the house-mouse, but has the capitulum wider as compared with its length. The general shape of the body is also

* "*Demodex folliculorum* des Menschen und der Tiere," Arch. Dermat. Syph., Wien, vol. xcii. 1908, pp. 25–96, 4 pls.; "Die *Acarus-raide* der Tiere," Zs. Tiermed. Jena, vol. xiii. 1909, pp. 1–32, 81–108, 4 pls.

rather different in this new *Demodex*, for there is a slight but distinct constriction or waist at the point where the abdomen joins the cephalothorax. Width of cephalothorax a little more than four times up to four and a half times the total length of the body (incl. capitulum). Cephalothorax + capitulum a little less than the length of the abdomen. Capitulum rather short, being wider than long (at the base); the oval internal portion is rather narrow, however. Spines on dorsal surface of capitulum fairly well developed and curved. Penultimate segment of palp salient and pointed laterally, as in *D. musculi*.

Measurements.—Total length (incl. capitulum) $173\ \mu$; length of cephalothorax + capitulum $85\ \mu$, of abdomen $98\ \mu$; greatest width of cephalothorax $39\text{--}41\ \mu$, of abdomen $34\ \mu$, of capitulum (at base) $27\ \mu$; length of capitulum $20\ \mu$.

Material.—Three dormice (*Muscardinus avellanarius*) were examined for *Demodex*, and all of them were found to be infected, but the parasites were few in number.

Demodex erinacei, sp. n.
(Var. of *D. caninus*?).

♀.—The *Demodex* occurring in the hedgehog is an elongated form closely resembling that of the dog (*D. caninus*) in almost every respect, but of larger size and with the capitulum wider as compared with its length, being very distinctly wider than long (at the base), instead of only slightly wider as in *D. caninus*; the sculpturing of the dorsal surface of the capitulum apparently is also rather different; the two spines are very like those present in *D. caninus*, being quite short. Body from over six to slightly more than seven times as long as wide. Cephalothorax + capitulum about a third of the total length. Transverse striations of body extending forwards beyond the coxæ of the fourth pair of legs, the first striation being deep and well-defined.

Measurements.—Total length $313\text{--}335\ \mu$; length of cephalothorax + capitulum $108\ \mu$, of abdomen $205\ \mu$; greatest width of cephalothorax $44\ \mu$, of abdomen $46\ \mu$, of capitulum (at base) $35\ \mu$; length of capitulum $26\ \mu$.

Material.—Several specimens from an English hedgehog.

LIII.—*South-African Talitridæ.* By the Rev. THOMAS R. R. STEBBING, M.A., F.R.S.

WHILE Dr. Chilton is reviewing the New Zealand members of this family, Mr. H. W. Bell-Marley is making interesting additions to the account given by Mr. Keppel Bernard of those which occur in South Africa. The trustees of the Durban Museum desire to have the records of the local fauna printed as well as published in Natal. Owing to this not unnatural species of patriotism, a rather long interval occurs before results arrived at in England can be passed through so distant a press. This may excuse the inconvenience of a brief preliminary notice for what I hold to be a new genus and species. At the end of October I received from Mr. Bell-Marley a number of Talitrid specimens, reddish-orange in colour as preserved, which he had found on Durban beach. He noticed that several were pairing, and the collection proved to have females, crowded with young ones, as well as males. After comparison of the latter sex with the synopses of the family drawn up in 1899 and 1906 and with subsequent notices, it seemed clear that the species could not belong to any of the known genera except *Hyalella*. But when a female specimen was examined in its turn, it showed a striking difference from all other species of that genus, numerous as they are. I therefore propose for these specimens

Genus EXHYALELLA, nov.

In general agreement with *Hyalella*, but having in the female the second gnathopod constructed like that of the male.

Exhyalella natalensis, sp. n.

The telson undivided, its distal margin not rounded, but obtuse-angled; the third uropod with narrow ramus shorter than the peduncle.

Full details and illustrative figures are reserved for future publication.

LIV.—*Descriptions and Records of Bees.*—LXXVIII.

By T. D. A. COCKERELL, University of Colorado.

Perdita perpulchra, Cockerell.

Male. Aguas Calientes, Mexico, Dec. 1, 1909 (F. C. Bishopp). New to Mexico.

Agapostemon cockerelli, Crawford.

Tlahualilo, Durango, Mexico, March 9, 1904, at peach-blossoms, 6 ♀ (*A. W. Morrill*). New to Mexico.

At the same flowers, at the same time, were taken females of *A. texanus*, Cresson, and *A. melliventris*, Cresson.

Agapostemon obscuratus, Cresson, var. *abjectus*, var. nov.

♀.—Head and thorax obscure dark green; wings brownish. Cabanas, Cuba, May 28 (*Palmer & Riley*).

Close to *A. femoralis*, but larger and with brownish wings, and the head and thorax quite differently coloured. I suppose that it is a form of Cresson's *obscuratus*, though that has the head and thorax black, with more or less purple tinge, while in our insect these parts are very distinctly green. There is more black on the hind femora than in *femoralis*, but a large pale yellow patch on the outer side remains. The scutellum is dark but shining olive-green.

Agapostemon nasutus, Smith, variety *a*.

♀.—Head deep purple-blue; metathorax (except in middle) and parts of sides of thorax green.

Frontera, Tabasco, Mexico.

A new locality for typical *A. nasutus* is Santa Eulalia, Peru, 3000 ft. alt., Jan. 18, 1913 (*C. A. T. Townsend*).

Ptiloglossa mayarum, Cockerell.

Tabernilla, Canal Zone, Panama, May 14, 1907 (*Aug. Busck*).

Previously known only from Guatemala.

Ptiloglossa eximia, Smith.

Male. On convolvulus, C. Bolivar, Venezuela (*M. A. Carriker*).

The marginal cell is longer in this species than in *P. mayarum* and *P. mexicana*.

Augochlora flammea, Smith.

Male. Very like the female, but the clypeus is broadly creamy white apically, and the basitarsi are yellowish white.

S. Lucreola, Vera Cruz, Mexico (*Crawford*).

Compared with a ♀ from F. Smith's collection.

Prosopis wootoni, Cockerell.

Meadow Valley, Mexico, Sept. (*C. H. T. Townsend*). New to Mexico.

This is true *wootoni*, not *P. divergens*, which I consider distinct.

Prosopis transvittata, sp. n.

♀ (type).—Length about 6 mm.

Robust, black; head and thorax dull, very densely punctured; cream-coloured markings on head, thorax, and legs; clypeus with a broad pale subapical band, which is trilobed on lower side; lateral face-marks elongate, filling space between clypeus and eye, thence extending upward with a slightly crenulate margin, to end obtusely on orbital margin a short distance below middle of front; flagellum obscure red beneath except at base; prothorax with an interrupted yellow band, not nearly reaching tubercles, which are light; tegulæ with a light spot; bases of tibiæ (the hind ones very broadly) cream-colour; area of metathorax dull, finely rugulose, more coarsely at base. Wings brownish. First abdominal segment shining, with very fine but distinct punctures; segments 1 to 4 with white apical hair-bands laterally.

♂.—Length about 5.5 mm.

Black, densely punctured as in the female, but punctures of first abdominal segment more distinct; face cream-colour up to level of antennæ, the broad supraclypeal mark extending between antennæ, the lateral marks extending upward as bands which end obtusely a little below middle of front; scape entirely black, not broadened; flagellum ferruginous beneath; markings on thorax and tegulæ as in female; anterior tibiæ in front, middle at base, hind on nearly basal half, and all the basitarsi light yellow; lateral abdominal hair-bands hardly as distinct as in female.

Meadow Valley, Mexico, 4 ♀, 3 ♂ (*C. H. T. Townsend*). U.S. Nat. Museum.

The female is more distinct on superficial examination than the male. By the light clypeal band it resembles *P. elliptica*, Kirby, but it is larger than that, with longer clypeus and

punctured first abdominal segment. The species is actually nearest to *P. episcopalis*, Ckll., from which the male is readily known by the less rugose area of metathorax and the orbits diverging more widely above. The mesothorax is rougher and more coarsely punctured than in *episcopalis*, but the difference is not important. Had I only a single specimen, I might think this a variety of *episcopalis*; but the good series indicates a distinct species.

Colletes speculiventris, sp. n.

♂.—Length 8.5 mm.

Black, rather slender, the tarsi obscurely reddish; face with pale ochreous-tinted hair, cheeks with white; clypeus exposed, glistening, densely striato-punctate, with a broad subapical depression; malar space distinctly broader than long, but not nearly twice as broad; labrum with a series of vertical sulci and a small median pit; mandibles red apically; flagellum long, very obscurely brownish beneath, the middle joints much longer than broad; hair of thorax dull white, but dark fuscous on scutellum, contrasting with the white of the axillæ; mesothorax shining, strongly punctured; base of metathorax with a series of very large smooth quadrate areas, separated by ridges; tegulæ dark reddish. Wings dusky; second s.m. very broad, receiving first r. n. in middle. Legs ordinary. Abdomen highly polished and shining, the segments with rather narrow apical white hair-bands; ventral segments with white hair-bands, broad at sides and very narrow in middle.

San Bernardino, Paraguay, Dec. 20 (*K. Fiebrig*, 2302). U.S. Nat. Museum.

This looks like a small *C. argentinus*, Friese, until the entirely different sculpture of the abdomen is observed. In Friese's table (1912) it runs nearest to *C. laticeps* from Chile. In Joergensen's table it runs nearest to *C. schrottkyi*, from which it is easily known by the dark hair on scutellum.

Pasiphaë chrysostoma, sp. n.

♂.—Length about 7 mm.; anterior wing 6.

Black, the flagellum dull reddish beneath except at base, the tarsi apically brownish; head subcircular, thick; clypeus densely covered with shining pale golden hair; tongue as in *Colletes*; mandibles black; front minutely punctured, the lower part tufted with long yellowish hair; antennæ short; a smooth shining space on each side of the ocelli; mesothorax smooth and shining, scarcely punctured; area of metathorax

triangular, smooth, a deep pit at apex; thorax above, especially on scutellum, clothed with very bright orange-fulvous hair; pleura with dull white hair; tegulae piceous. Wings hyaline, faintly dusky, stigma dull fulvous, nervures fuscous; b.n. meeting the oblique t.-m. Legs slender, the hind pair long; spurs very pale reddish; hair of legs white. Abdomen broad, moderately shining, the hind margins of the segments with conspicuous pale fulvous hair-bands.

Carcarana, Argentina (*L. Bruner*, 83), U.S. Nat. Museum.

Readily known by the bright hair of thorax above. It may be compared with the much larger *P. franki*, Friese, from Buenos Aires.

Pasiphaë leucostoma, sp. n.

♂.—Length about 8.3 mm.; anterior wing 6.

Black, the flagellum obscurely brownish beneath; slender, with rather long and narrow abdomen; apical half of mandibles dark chestnut; face and clypeus densely covered with silky white hair; a smooth shining space on each side of ocelli; antennae rather short; mesothorax and scutellum polished and shining, slightly glaucous, with very remote and minute punctures; area of metathorax large, triangular, the basal part very finely transversely striate, the apical with a deep pit; hair of thorax white, tinged with ochreous dorsally; tegulae piceous. Wings hyaline, faintly dusky, stigma and nervures rufo-fuscous. Legs ordinary, with white hair; hind legs long and slender. Abdomen without any distinct hair-bands, though the fourth and following segments have thin bands of glittering white hair, which becomes dense at apex; surface of abdomen dullish, glaucous, the second and third sutures obscurely reddish; fourth and fifth ventral segments with conspicuous fringes of pure white hair.

Carcarana, Argentina (*L. Bruner*, 38, 73). U.S. Nat. Museum.

Resembles the Chilean *P. tristis*, Spinola, but that has the abdomen shining and hind margins of segments testaceous.

Lonchopria rufipennis, sp. n.

♂ (type).—Length about 11 mm.; anterior wing 8.5.

Black, without metallic tints; head and thorax above with pale ochreous hair; face, cheeks, and lower part of thorax with creamy-white hair; mandibles reddish apically, bidentate; face broad, inner orbits nearly parallel; face and front densely covered with hair; malar space extremely

short; antennæ short, flagellum dull reddish beneath except at base; mesothorax shining, sparsely punctured in middle; area of metathorax triangular, not polished; tegulæ clear rufo-testaceous. Wings strongly reddened, dusky on apical margin, stigma and nervures ferruginous. Legs with pale hair; anterior tibiæ and tarsi ferruginous in front. First abdominal segment with long pale ochreous hair, the margins of segments 1 to 5 with entire white hair-bands, only moderately broad; venter polished.

♀.—Similar, but more robust; fimbria on last two segments of abdomen dark chocolate.

Variety *parva*, var. n., ♂.—Uniformly smaller; anterior wing 7 mm. long.

Carcaraña, Argentina (*L. Bruner*, 35; the ♀ 78; var. *parva*, 48). U.S. Nat. Museum.

I separated the var. *parva* (3 ♂) as a distinct species on account of the uniformly small size; but there are apparently no good structural characters. Probably the large and small races visit different flowers. Years ago, I think before *Louchopria* was published, Mr. J. C. Crawford examined the mouth-parts, and attached a label, "Colletidæ, n. gen.?" The palpi, from Mr. Crawford's mount (male of larger race), measure as follows in microns:—Labial palpi, joints (1) 112, (2) 96, (3) 96, (4) 128; maxillary palpi, joints (1) 144, (2) 80, (3) 80, (4) 80, (5) 80, (6) 128. The palpi are pale and much more delicate than in *L. alopec*, Ckll.

This species may be compared with *L. nivosa*, Vach., but is easily known by the reddened wings and finely and densely punctured ♀ clypeus.

Camptopœum reedi, sp. n.

♀ (type).—Length about 8 mm.

Robust, black, not at all metallic; head, thorax, abdomen, and legs with abundant pale hair, distinctly ochreous-tinted on head and thorax above; eyes grey; face broad; labrum transversely striate; face with creamy-white markings as follows:—large triangular mark in middle of clypeus, supra-clypeal transverse band, and more or less L-shaped lateral face-marks, the upper arm of the L (along the orbit) suddenly narrowing at about level of antennæ, and above that linear; flagellum ferruginous beneath except at base; vertex dull; mesothorax and scutellum shining; base of metathorax with a transverse obtuse polished ridge; tegulæ piceous. Wings hyaline; stigma reddish, very small; b. n. falling short of

t.-m.; second s.m. long, narrowed about half above. Legs slightly brownish, anterior knees with a yellow spot; spurs red. Abdomen broad, shining, segments 2 to 4 each with a broadly interrupted basal cream-coloured band, the lower margin of which on each side is convex; apical segments with a good deal of black hair; ventral segments with thin fringes of long hair. Maxillary palpi with six subequal joints, the basal ones the longest; labial palpi with one long joint and three short ones, which together do not exceed the long ones.

♂.—More slender; pale markings light lemon-yellow, as follows:—face below antennæ (including supraclypeal band and dog-ear marks), rapidly narrowing extensions of lateral marks about halfway up sides of front, interrupted band on prothorax above, anterior and middle knees, anterior tibiæ in front, greater part of anterior tarsi, a rather vague mark at base of middle tarsi, and basal bands on abdominal segments 2 to 6, at most slightly interrupted in middle. The apex of abdomen has a long tuft of fuscous hairs, curled upward, appearing pallid when seen from beneath. On the venter, subapically, is a broad strap-shaped lobe, broadest in middle, emarginate at end, and with plumose hairs arranged along the sides as a fringe, the apex also hairy. This lobe arises from the apical margin of the fifth segment.

Type from Santiago, Chile; two ♀s received years ago from Prof. E. S. G. Titus as *C. submetallicum*, Spinola, which is a larger insect with greenish abdomen, belonging to the genus *Liopœum*.

There are also before me 2 ♀ and 1 ♂ of *C. reedi* collected by E. C. Reed in Chile (U.S. Nat. Museum). I expected to find this identical with one of the species of Spinola, Fries, or Vachal; but it is evidently distinct from all. There is a superficial resemblance to the paler-haired form of *C. hirsutulum*, Spin.

LV.—Notes on *Georychus* and its Allies.

By OLDFIELD THOMAS.

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IN 1898 * Mr. de Winton, in a note on *Georychus*, drew attention to the important characters which separate *G. capensis*

* Ann. & Mag. Nat. Hist. (7) ii. p. 8.

—the genotype—from the great mass of the species usually assigned to that genus, and proposed to recognize the two groups so distinguished as subgenera, accepting for the second subgenus the name *Cryptomys* from Dr. Gray's paper of 1864*.

This division appears to me thoroughly sound, especially as, in addition to the tooth-characters mentioned by de Winton, there is a material difference in the structure of the posterior palate, *Cryptomys* having this quite normal, while in *Georychus* (s. s.) the capsules of the incisor-roots are extended backwards into the pterygoids in a manner approaching that found in *Heliophobius*.

On the whole, therefore, it would appear to be advisable to recognize *Cryptomys* as a full genus distinct from *Georychus*, the great majority of the described species falling into it. On the other hand, Gray's *Cætomys* is not worthy of any sort of recognition.

Restricted *Georychus*—the *capensis* group—inhabits the extreme south of Africa, ranging northwards to Namaqualand on the west and the Transvaal in the east. *Cryptomys* only overlaps it along a comparatively narrow zone, but ranges northwards from Knysna and Natal over the whole of the Ethiopian region to Nigeria and Togoland.

As regards species, the genus *Cryptomys* is extraordinarily uniform both externally and cranially, the many forms described only differing, apart from size and a limited range in colour, by characters of but little importance, such as slight differences in the shape of the nasals, the relative lengths of premaxillary processes and the nasals, and the shape of the anteorbital foramina. Moreover, these differences, such as they are, are curiously inconstant in the group, almost any good series from one locality being liable to contain individuals with the characters supposed to be peculiar to other species. This is notably the case with the apparently important character of the anteorbital foramina, which in some cases may be high and lunate, with slender boundaries, or small and subcircular, with thick ones, in specimens taken in the same localities and obviously of the same species†. Young specimens tend to be of the former

* P. Z. S. 1864, p. 123.

† The type-skull of *G. nimrodi*, de Wint., has a subcircular foramen on one side and a high one on the other. And anyone to whom the British Museum collection is accessible should compare 4. 3. 1. 88 and 92, both from Vredefort Road (*Barrett-Hamilton*), which have the extremes of difference in the anteorbital foramina, and 5. 5. 1. 14 with 14. 5. 4. 20,

shape, and old ones of the latter, but individual exceptions to this rule are very numerous. No doubt the shape of the foramen is a good enough character, if care be taken that it is regarded as an average and not an invariable one, but species should certainly not be described on it alone without quite considerable series.

Of course, in species isolated geographically, such as *Cryptomys foxi* or *zechi*, the characters are more constant, but where, as in the southern half of Africa, the animals are found everywhere and no barrier to distribution exists, it may almost be said that any character of skull may be found in any species, thus absolutely nullifying geographical splitting of the usual type.

Even size, when the giant northern species are put aside, is of but little use, for in any series of skulls a few individuals will be found much larger than the great majority, these animals appearing to add to the bulk of their skulls long after they have attained adult life. For example, the type-skulls of both *C. bocagei*, de Wint., and *C. whytei*, Thos., are so much larger than others from the same areas that they might readily be thought specifically different from them.

Of course, I do not mean that the skull-characters are negligible, but only that a much more liberal view of their inconstancy and want of importance should be taken than is the case in other mammals. Let anyone look at Mr. Austin Roberts's figures of skulls, and he will see how essentially similar they all are to one another.

The mammary formula of *Cryptomys* appears to be always $2-1=6$. At least, this is the number I find in every spirit-female we have, whatever its locality. Mr. Roberts's statement that some of the species have no inguinal pair is probably due to his having attempted to count mammæ on fresh specimens, which is almost as difficult and untrustworthy as doing so on skins. Spirit-specimens are alone to be trusted for this particular purpose, as every mammalogist of any experience is aware.

It may be of interest to record that *Cryptomys*—or, at least, some of the species of it—possesses that most unusual structure, an *os clitoridis*. In a specimen of *C. mechowii* it is an oblong flattened bone 5 mm. in length, 1.5 in breadth, and 0.5 in thickness, not very much smaller than the corresponding

both from the same farm at Willbrook, Estecourt (*Wroughton & Turner*), which equally have the extremes as regards the posterior nasal regions, other specimens from the same series filling up the gap between them.

bone of the male. The latter, however, is of more normal shape, round in section, thick at base, tapering terminally.

One of the causes of the wide distribution of similar forms is no doubt the habit of these animals of frequenting in the dry-season the empty beds of the rivers, and then when the water comes down in flood such as survive are carried along to make further colonies lower down, by which process the *Cryptomys* of rivers hundreds of miles in length are preserved from local isolation.

These facts about this difficult group have been gradually impressing themselves on mammalogists for some time, and it was hoped that by the increase of collections and literature a proper understanding of the true state of things would be reached. But unfortunately for South-African mammalogy a worker in the Transvaal Museum has recently written a number of papers * in which he has given names to nearly a score of "species" of *Cryptomys* without reference to any of the older collections or any adequate quotation of the literature of the subject. He appears not to have learnt the underlying basis of scientific mammalogy, which is the non-occurrence of closely allied species on the same ground, for we find such surprises as the description of four species of small *Cryptomys* from Pretoria alone and many others from its near neighbourhood. His species are ostensibly based on the characters of the skull—now known, as above explained, to be of little importance,—but these are so described and with such insufficient comparison one with another that it is quite impossible to identify them. Even an albino is described as a new species, *Georychus albus*!

The character of the work is of the same quality in other groups of mammals.

These papers are published in the official journal of the Transvaal Museum, and I would respectfully urge on the authorities of that institution to consider what a fatal effect the issue of such work is likely to have on the reputation of their Museum and its standing in scientific estimation. I feel perfectly certain that they will not wish their finely got up journal to be the vehicle for what is little short of a catastrophe to one of the sciences they deal with.

Mr. Roberts's obvious enthusiasm for mammalogy might have been made of the greatest service to science had he consulted any of the older workers, and had he learnt from them a little caution before rushing into print on so difficult a subject.

* Austin Roberts, "The Collection of Mammals in the Transvaal Museum," *Annals of the Transvaal Museum*, 1913, and Supplements, 1914-1917.

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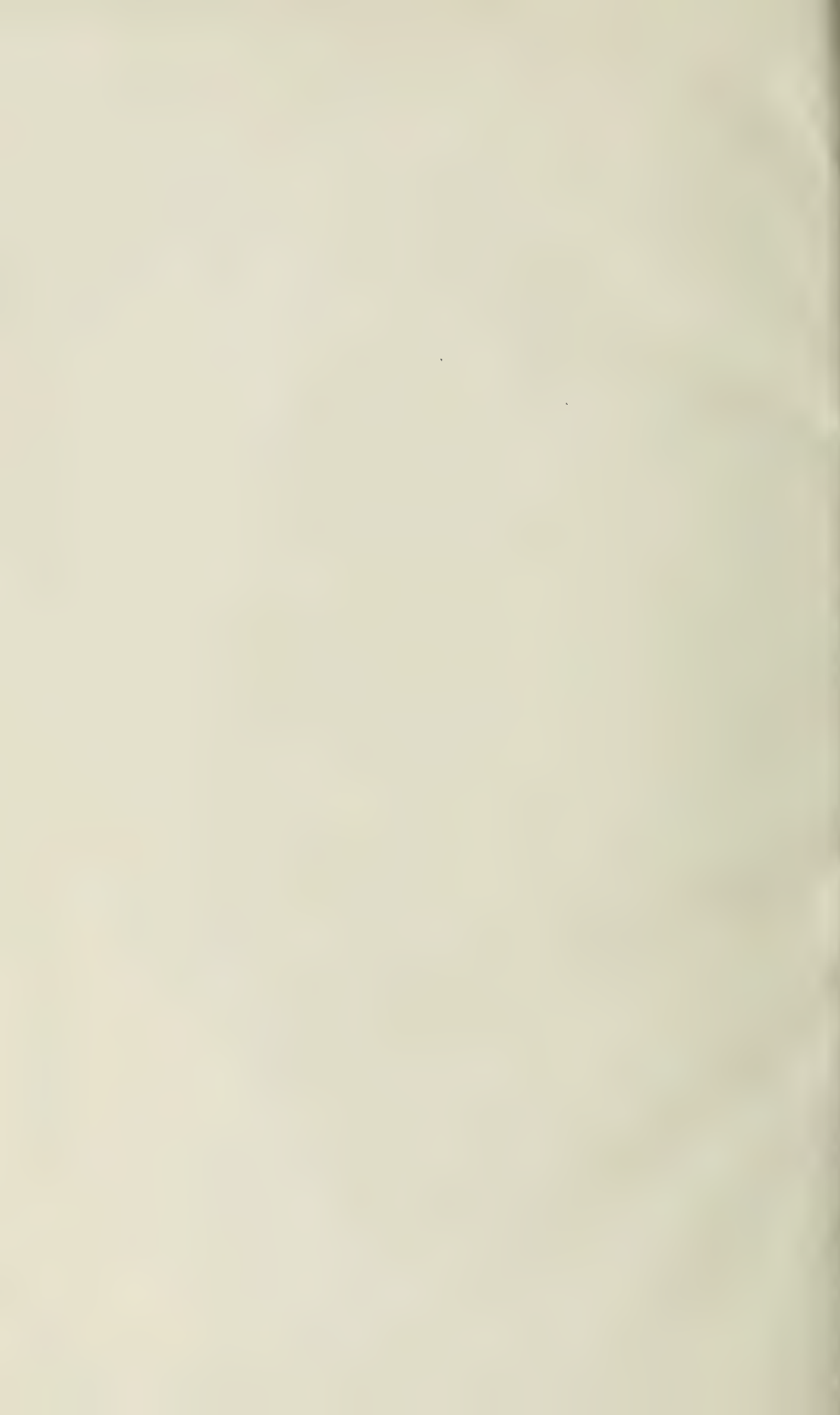
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END OF THE TWENTIETH VOLUME.



Andre Nijthuis

NEW HETEROCERA FROM DUTCH NEW GUINEA.





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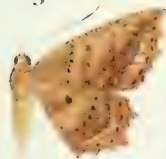
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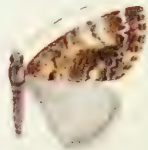
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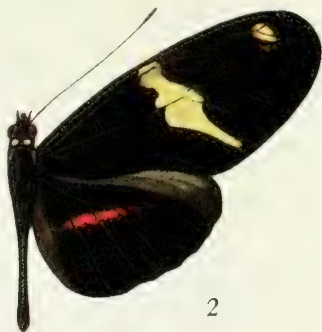


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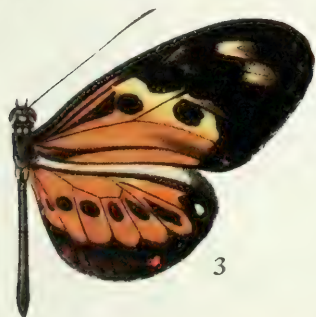
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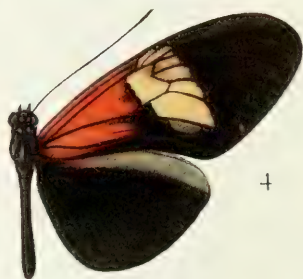
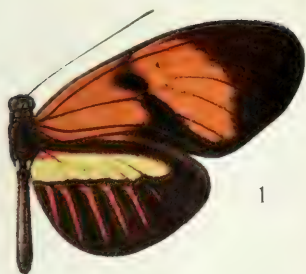
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1. The first part of the paper is devoted to a review of the literature on the topic.

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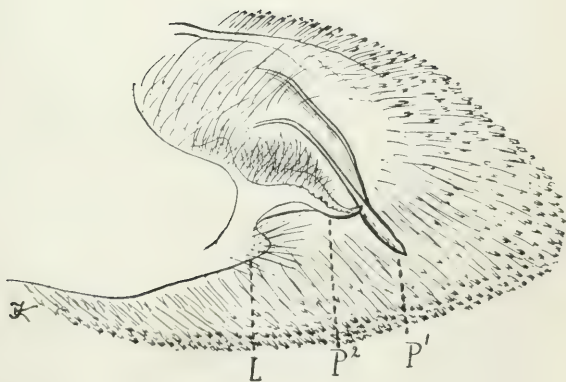
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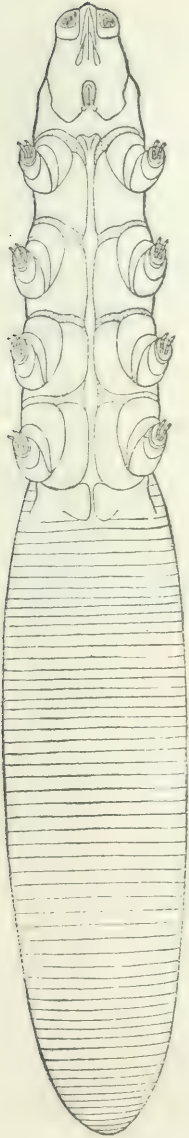


FIG. 1.

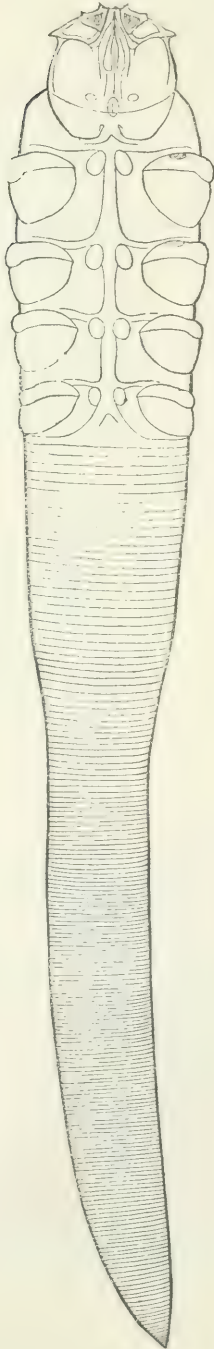


FIG. 2.

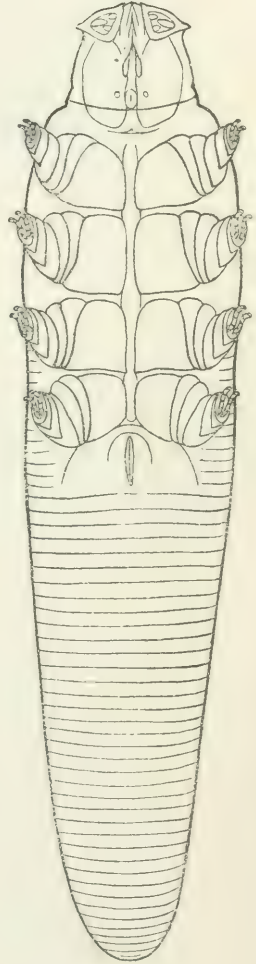


FIG. 3.

FIG. 1.



FIG. 2.



FIG. 5.



FIG. 3

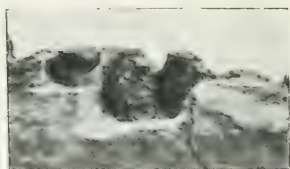
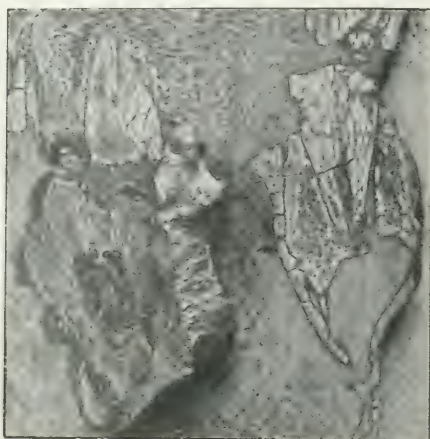


FIG. 4.



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